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Interlevel Correlations of Temperature and Density, Surface to 60 km

ALLEN E. COLE
ARTHUR J. KANTOR
EUGENE A. BERTONI

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Statistical techniques have been developed which can be used to determine the effect of density and temperature on the trajectories of reentry vehicles for altitudes between the surface and 60 km. Arrays of monthly means and standard deviations of density and temperature at 2-km intervals of altitude to 60 km, together with interlevel coefficients of correlation of density with density and temperature with temperature, are provided for the mid-season months (January, April, July, October) at 10 locations between latitudes 8°S and 64°N. These data are in a format that can be easily used to estimate the

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distributions of vertical density and temperature gradients and the effects of day-to-day density variations on the trajectories of reentry vehicles.

Preface

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Interlevel Correlations of Temperature and Density, Surface to 60 km

1. INTRODUCTION

Geographical, seasonal, and day-to-day variations in the vertical distributions of atmospheric density and temperature must be considered in the design and operation of reentry vehicles. The atmospheric drag coefficients for a given vehicle are a function of the Mach number, which is directly related to ambient temperature. Variations in the distribution of atmospheric density affect the predicted deceleration and range of free-fall bombs and ballistic missiles that have high forward velocities. Thus, the purpose of this report is to develop statistical presentations that can be used to determine the influence of density and temperature distributions on the trajectories of reentry vehicles at altitudes between the surface and 60 km.

This work is part of a continuing effort to compile, analyze, and present information on the distribution of thermodynamic properties of the atmosphere in a form suitable for use in the design and operation of aerospace vehicles. An economical method of estimating the effect of density and temperature on reentry vehicles by the use of interlevel coefficients of correlation of density with density and temperature with temperature is described. A technique is also presented for obtaining estimates of these interlevel relationships in regions of sparse data.

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In evaluating the accuracy of a proposed missile system, estimates must be made of the effect of day-to-day variations in density on the impact point. The most direct approach to this problem is to calculate individual points of impact in each target area using a representative sample of observed density profiles from each region. This task could be time consuming, especially if several types of aerodynamic designs and various reentry angles are being investigated. A simpler approach is possible if the effect of density at each level is known to be independent or nearly independent of the effects at other levels, as it is believed to be in most cases. The required representative sample of soundings can then be summarized statistically and presented in an array so that only a simple arithmetical calculation is required to find the missile range and its standard deviation.

Arrays of means and standard deviations of density and temperature at 2-km intervals of altitude from the surface to 60 km, together with interlevel coefficients of correlation of density with density and temperature with temperature, are presented for the mid-season months at four locations. The same type of data are also presented for altitudes between 26 and 60 km at six additional locations. Both sets of data, ranging in latitude from 8° S to 64° N, are in a format that can be readily used to determine the integrated effect of density and temperature variations on the trajectories of reentry vehicles.

The integrated effect (E) of mean monthly density on the trajectory and impact point of a missile can be determined for a specific location by computer-simulated "flights" through mean monthly or seasonal density profiles, if the proper influence coefficients (c_i) for the missile at various levels are given:

$$E = \Sigma\ c_i \bar{\rho}_i \ . \tag{1}$$

where $\bar{\rho}_i$ is the mean monthly density at the i'th level. The integrated standard deviation of the range, or deceleration due to day-to-day variations from the mean seasonal or monthly density profiles, can be obtained:

$$\sigma^2_{int} = \Sigma_{ij}\ c_i\ \sigma_i\ R_{ij}\ c_j\ \sigma_j \ , \tag{2}$$

where σ^2_{int} is the integrated variance for all layers being considered, c_i and c_j are influence coefficients at levels i and j, σ_i and σ_j are the standard deviations of density at levels i and j, and R_{ij} is the coefficient of correlation between densities at levels i and j.

Previous statistical presentations of the vertical density distributions suitable for reentry studies were prepared for levels up to 30 km from radiosonde observations by Cole and Court[1] and by Cole and Nee.[2] Investigations at altitudes above 30 km had been hampered by the lack of adequate data. Only during the past few years have sufficient observations become available from Meteorological Rocket Network (MRN) stations for such investigations.

2. DATA SOURCES AND ACCURACY

The statistical arrays of the means, standard deviations, and interlevel coefficients of correlation of density and temperature for altitudes up to 60 km are based on radiosonde and MRN observations taken at the 10 locations shown in Table 1. At four of these sites, radiosonde and rocketsonde observations taken within a few hours of each other were combined to provide individual density and temperature profiles from the surface to 60 km. Rocketsondes without accompanying radiosondes were used at the six remaining sites to develop statistical properties of the density and temperature distributions between 26 and 60 km. Only observations that were taken at least 3 days apart were used in an attempt to reduce the effects of persistence on the statistical properties of the elements being studied. It has been shown by Durst[3] that the coefficients of correlation (R) for meteorological elements observed at various time intervals at levels between 5 and 20 km follow the law $R = e^{-aT}$, where a equals 6.9×10^{-6} sec^{-1} and T is measured in seconds. In a 3-day interval, the coefficients of correlation between observations are generally less than 0.2, approaching independence.

Temperatures were obtained at 2-km intervals of geopotential altitude below 30 km from individual radiosonde observations by linear interpolation between values at standard and significant pressure levels whose heights had been computed hypsometrically. Densities were interpolated logarithmically. Errors introduced by logarithmic interpolation of density are unimportant, generally < 1 percent at radiosonde heights.[2] The root-mean-square (rms) observational errors in radiosonde temperatures vary linearly with altitude from 1°K at the surface to from 2 to 5°K at 30 km, and the estimated rms errors in densities derived from these measurements range from 0.2 percent at the surface to 1.0 percent at 30 km.[4]

1. Cole, A.E., and Court, A. (1962) Density Distribution, Interlevel Correlations, and Variation with Winds, AFCRL-TR-62-815.
2. Cole, A.E., and Nee, P.F. (1965) Correlations of Temperature, Pressure, and Density to 30 km, AFCRL-TR-65-43, AD 612651.
3. Durst, B.A. (1954) Variation of Wind with Time and Distance, Geophysical Memoirs No. 93, British Meteorological Office.
4. Meteorological Group, Range Commanders Council (1977) Meteorological Data Error Estimates, Document 110-77, White Sands Missile Range, NM.

Temperatures and densities were obtained from MRN observations at geometric altitudes between 26 and 60 km. The estimated rms observational errors in rocketsonde temperatures vary linearly with altitude from 1.5°K at 25 km to 3.5°K at 70 km, and the rms errors in densities derived from rocketsonde measurements are estimated to vary from 1 percent at 30 km to 5 percent at 60 km.[4]

Table 1. Observational Sites

Station	Location		Altitudes	Period of Record
Ascension Island	8°S,	14°W	Surface to 60 km	1969—1976
Kwajalein	9°N,	168°E	Surface to 60 km	1969—1976
Wallops Island	38°N,	75°W	Surface to 60 km	1969—1976
Churchill	59°N,	94°W	Surface to 60 km	1969—1976
Fort Sherman	9°N,	80°W	26 to 60 km	1969—1976
Barking Sands	22°N,	160°W	26 to 60 km	1969—1976
Cape Kennedy	28°N,	80°W	26 to 60 km	1969—1976
White Sands	32°N,	106°W	26 to 60 km	1969—1976
Primrose Lake	55°N,	110°W	26 to 60 km	1969—1976
Poker Flats	64°N,	146°W	26 to 60 km	1969—1976

The observed rms variations (σ_o) around the monthly means contain the true rms variability due to changes in synoptic conditions (σ_T) and the rms observational error (σ_E). If the true variability and observational errors are assumed to be independent, the observed rms variability is given by:

$$\sigma_o = \sqrt{\sigma_T^2 + \sigma_E^2}\,. \qquad (3)$$

Consequently, the effect of observational errors must be carefully evaluated to determine how much of the variability that is indicated by the uncorrected soundings is due to synoptic changes in weather patterns. These errors have less effect on the mean monthly values of temperature and density given in the appendices, because the rms error of the mean monthly values is equal to the rms value of the error of an observation divided by the square root of the number of independent observations used for computing the monthly means.

3. TEMPERATURE

Statistical arrays of mean monthly temperatures, standard deviations, and interlevel coefficients of correlation are given in Appendix A for altitudes up to 60 km. An indication of the variations in the vertical distributions of mean monthly temperatures with geographical location can be obtained from the temperature-altitude profiles for each of the four mid-season months shown in Figure 1 at Ascension Island (8S), Wallops Island (38N), and Churchill (59N). The most striking feature of these comparisons is seen at the two levels where the temperature profiles for the three locations converge or cross. The first such level occurs near 12 km; the second, between 22 and 26 km. Below 12 km, the temperature profiles tend to parallel each other, indicating that geographical differences in the mean monthly temperature-lapse rates in the troposphere are relatively small. Locations that have the warmest temperatures below 12 km have the coldest temperatures between 12 and 24 km. The largest geographical temperature variations occur at the surface in January, April, and October, and at 16 km in July. Above 24 km, the variability of the profiles with latitude is largest in October and January.

Seasonal changes in the temperature-altitude profile at each of the three locations are illustrated in Figure 2. Differences in mean monthly temperatures are largest at the surface and smallest near 12 km. The vertical temperature gradients in the troposphere are negative and remain relatively constant throughout the year. The mean monthly vertical gradients in the stratosphere are positive in all months at Ascension Island and Wallops Island; at Churchill, they are slightly negative or isothermal between 10 and 28 km in January, October, and April and slightly positive in July.

Standard deviations of the day-to-day variations around the mean monthly temperatures at levels between the surface and 60 km are tabulated in Appendix A and are plotted in Figure 3 for January and July at Ascension Island, Wallops Island, and Churchill. These variations, due to day-to-day changes in weather patterns, are largest in January and at high latitudes, whereas in July the variations are approximately the same at all latitudes. The magnitude of the seasonal difference in the standard deviations of temperature at these altitudes increases with latitude.

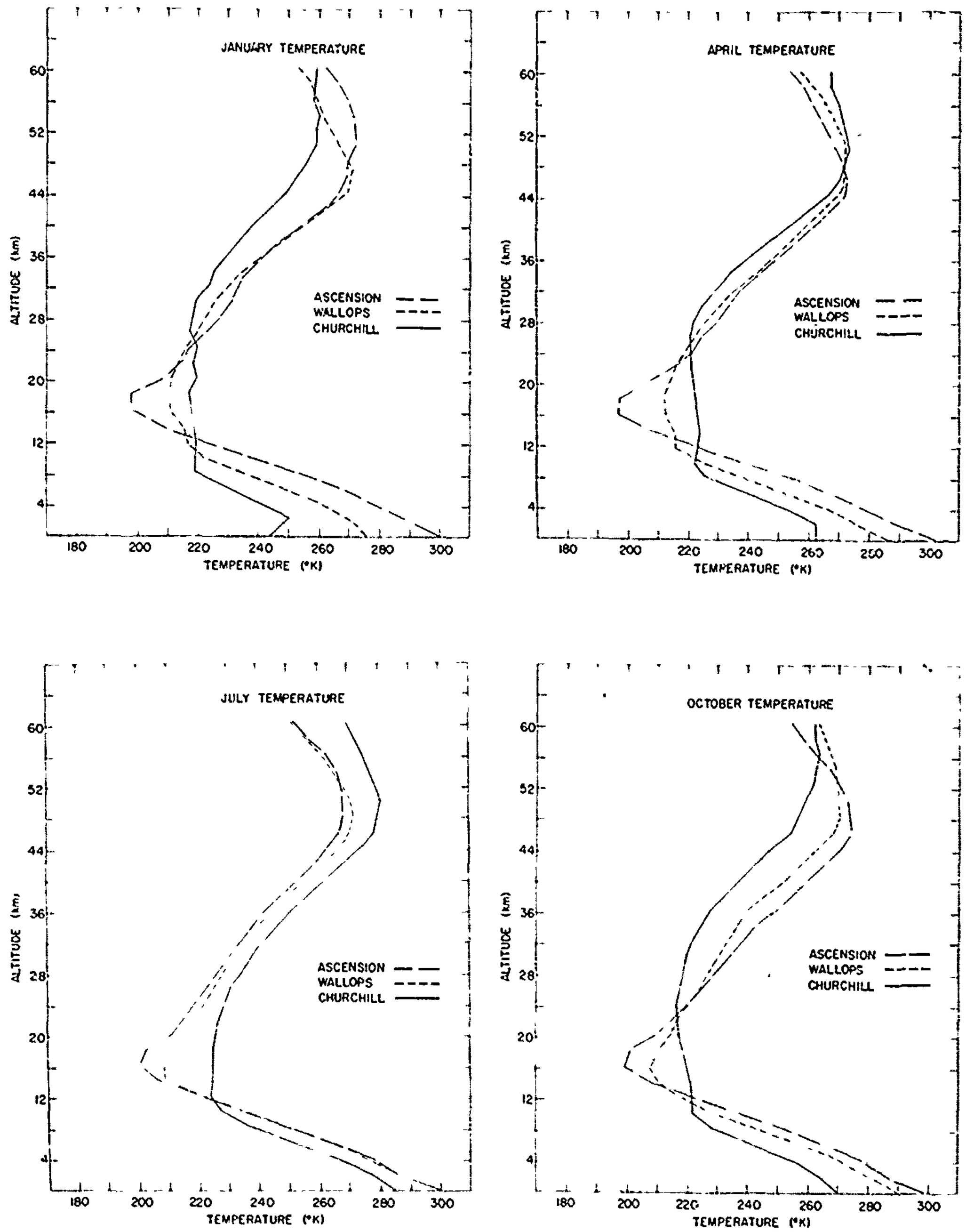

Figure 1. Latitudinal Changes in the Temperature-Altitude Profiles for the Mid-Season Months at Ascension Island, Wallops Island, and Churchill

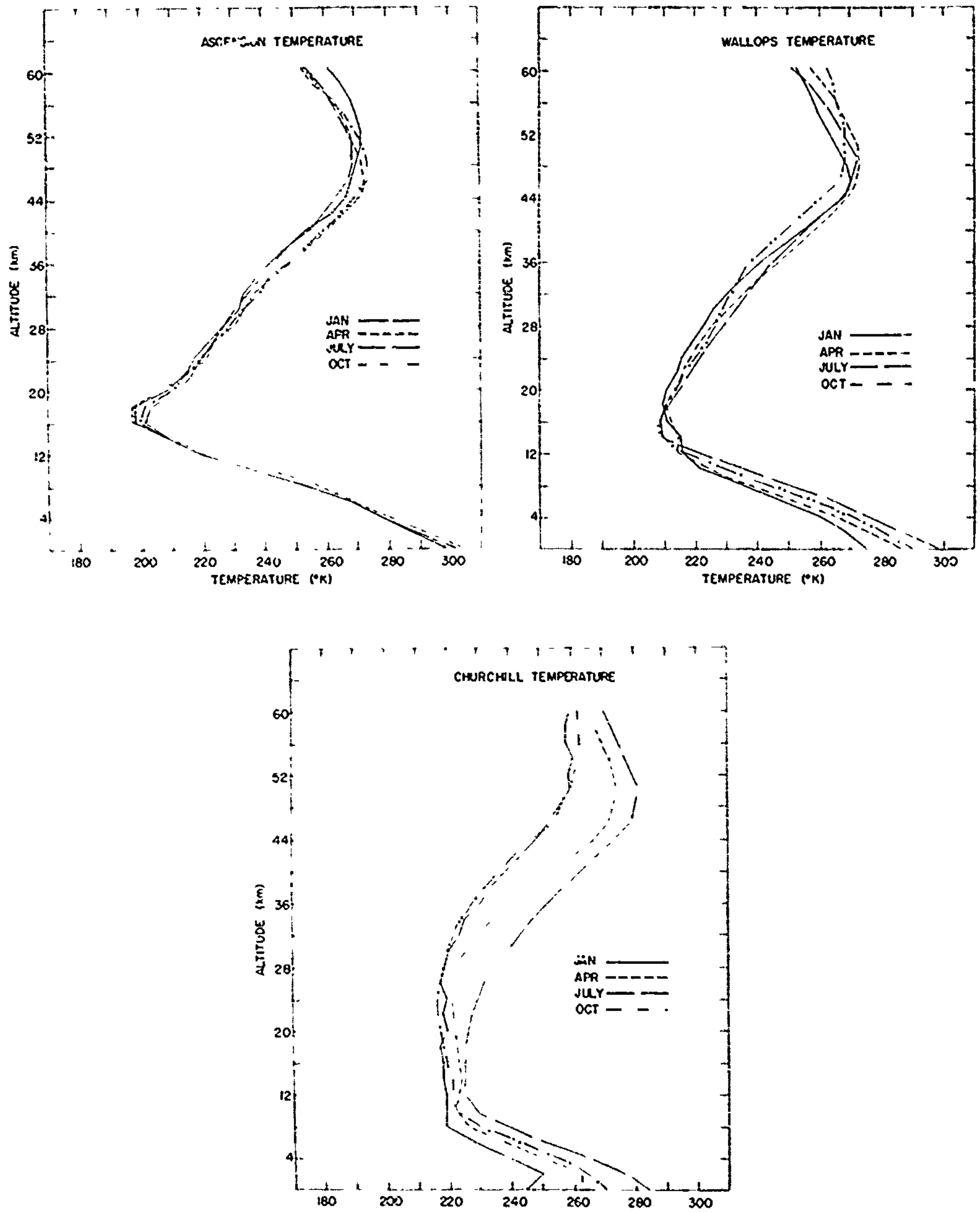

Figure 2. Seasonal Differences in the Temperature-Altitude Profiles at Ascension Island, Wallops Island, and Churchill

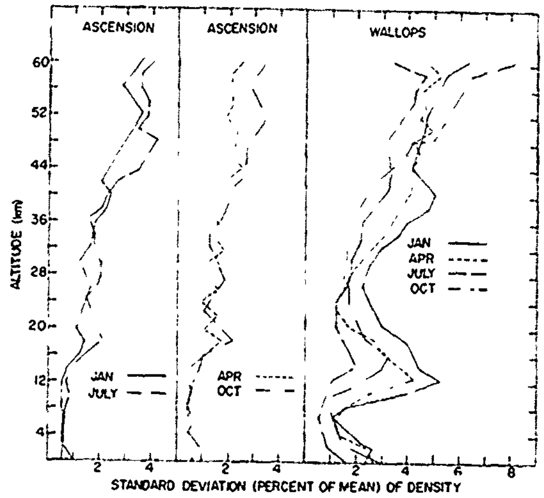

Figure 3. Day-to-Day Variability Around Mean Monthly Temperatures for January and July at Ascension Island, Wallops Island, and Churchill

The day-to-day variations around mean monthly densities are plotted vs altitude in Figure 6 as coefficients of variation (100 × SD/mean) for the mid-season months at Ascension Island, Wallops Island, and Churchill. These variations increase markedly with latitude, particularly during winter. In July, however, they are essentially the same at all latitudes.

4. DENSITY

Arrays of mean monthly densities, standard deviations, and interlevel correlations for altitudes up to 60 km are given in Appendix B. The mean densities for each of the mid-season months at Ascension Island, Wallops Island, and Churchill are plotted versus altitude in Figure 4 as percentage departures from the U.S. Standard Atmosphere, 1976.[5] The individual profiles cross or converge near 8 km and between 22 and 26 km. Both are levels of minimum density variability. There is an isopycnic level near 8 km at which mean monthly densities depart from standard by no more than 1 or 2 percent, regardless of location and season. However, between 22 and 26 km there is a marked seasonal variability, even though there is very little latitudinal variability.

Seasonal changes in the mean monthly density profiles at each of the three locations are shown in Figure 5. The minimum seasonal variability, 1 or 2 percent, occurs at 8 km and the maximum occurs above 60 km.

5. COESA (1976) U.S. Standard Atmosphere, 1976, GPO, Washington, D.C.

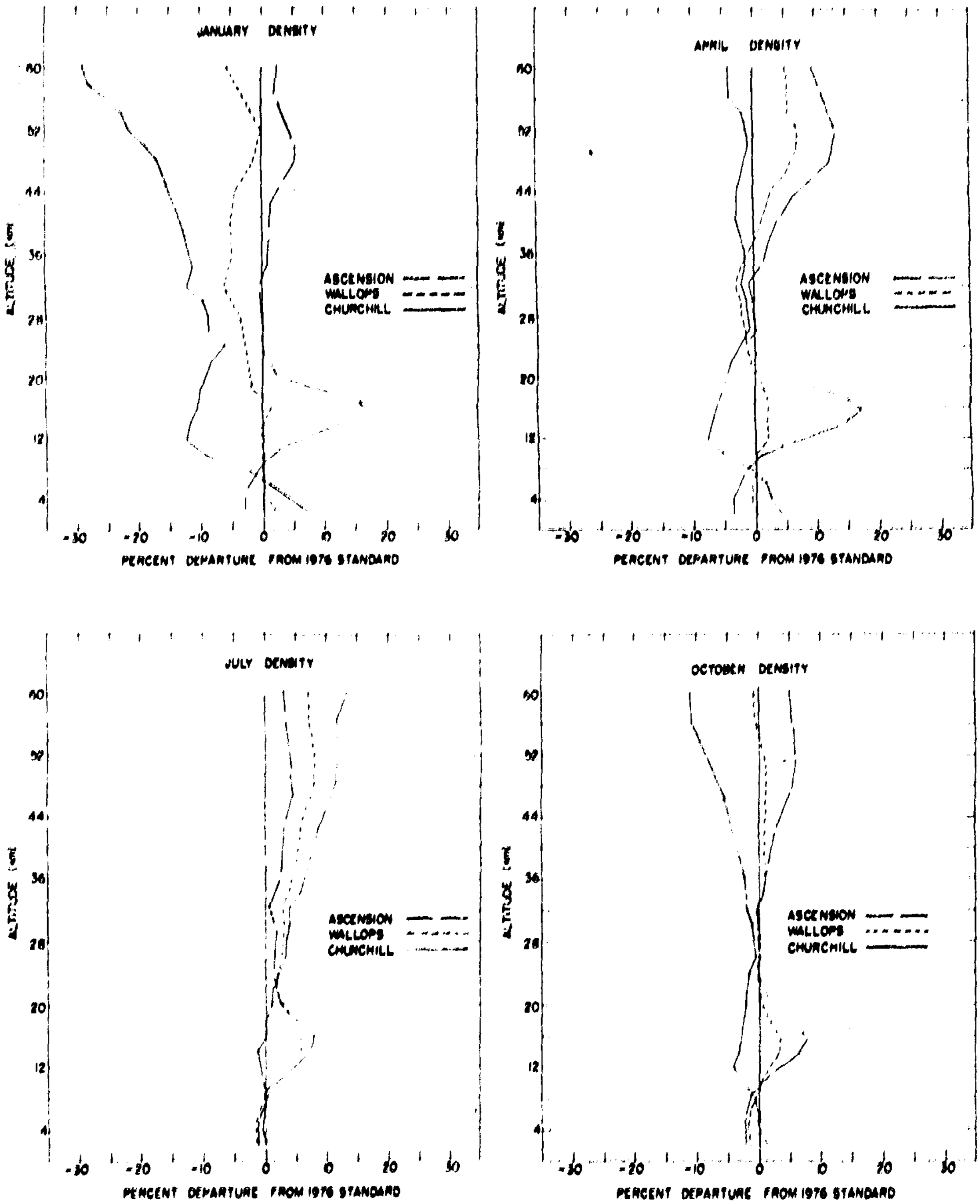

Figure 4. Latitudinal Changes in the Density-Altitude Profiles for the Mid-Season Months at Ascension Island, Wallops Island, and Churchill

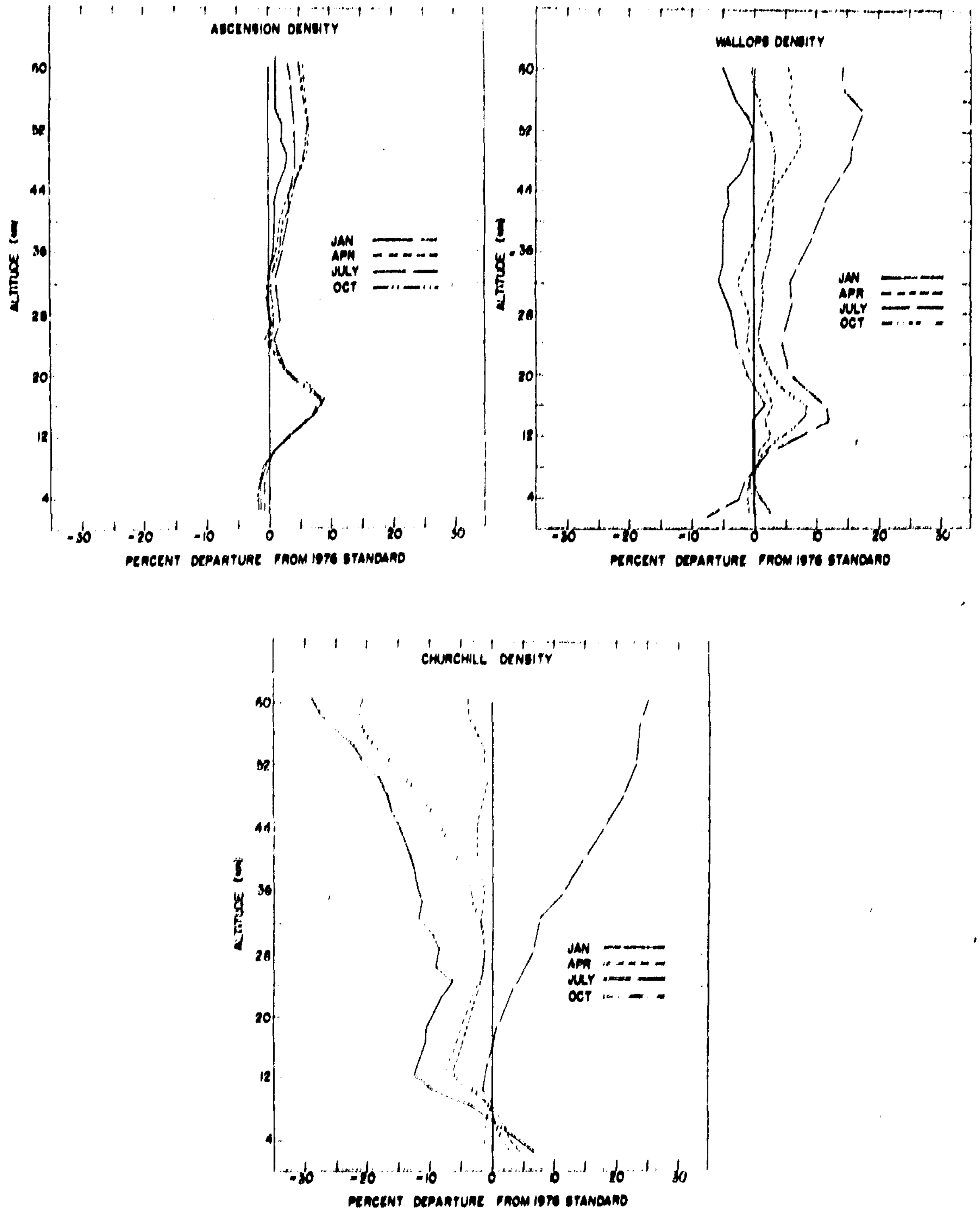

Figure 5. Seasonal Differences in the Density-Altitude Profiles at Ascension Island, Wallops Island, and Churchill

The day-to-day variations around mean monthly densities are plotted vs altitude in Figure 6 as coefficients of variation (100×SD/mean) for the mid-season months at Ascension Island, Wallops Island, and Churchill. These variations increase markedly with latitude, particularly during winter. In July, however, they are essentially the same at all latitudes.

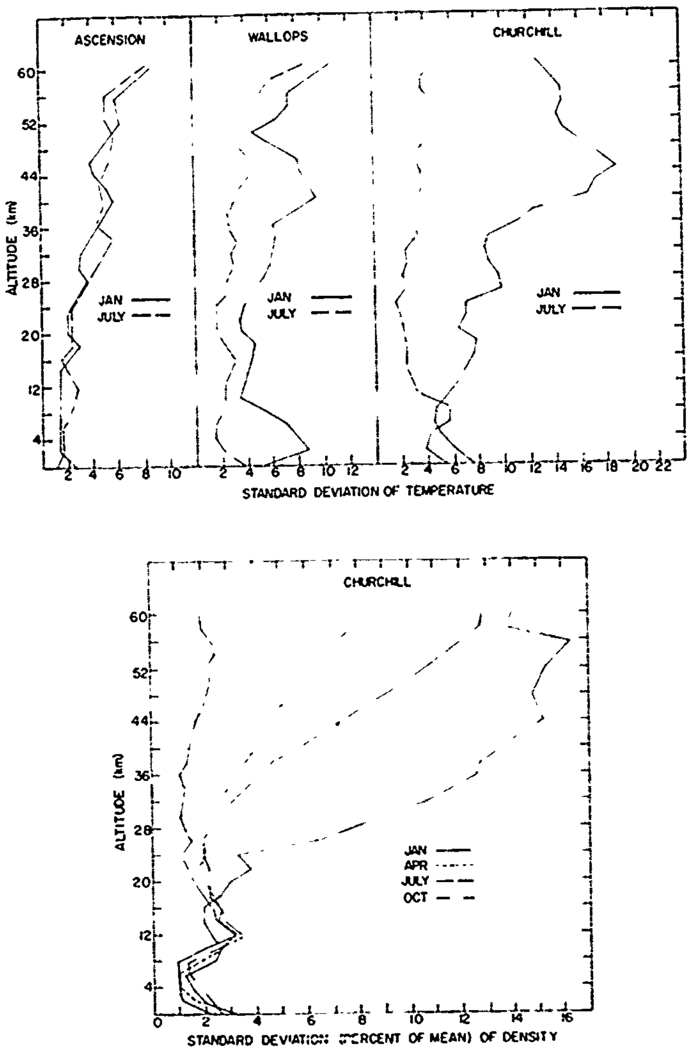

Figure 6. Day-to-Day Variability Around Mean Monthly Density for the Mid-Season Months at Ascension Island, Wallops Island, and Churchill

5. INTERLEVEL CORRELATION

The manner in which the correlation between densities at two levels decreases (or decays) with increasing separation between the levels is an example of the general problem of correlation decay. Similar correlation decay is found for most meteorological elements as the horizontal or vertical distance between the points of observation or the time interval between observations increases. As yet, no fully satisfactory description of the decay rate, based on fundamental properties or assumptions, is available. Consequently, many empirical models that are valid for specific elements over restrictive ranges have been proposed.

Profiles of coefficients of correlation, R, of surface density with density at other altitudes are shown in Figure 7 for each of the mid-season months at Kwajalein, Wallops Island, and Churchill. During all four seasons and at all three locations the correlation between surface density and density at other altitudes decreases rapidly as the vertical distance between levels increases, approaching zero by 8 or 10 km. The correlation then generally remains near zero or slightly negative at altitudes between 10 and 60 km. The low correlation between the surface density and the density at levels between 10 and 60 km indicates that very little information on deviations from the mean monthly density profiles between 10 and 60 km can be obtained from observations of surface density.

Profiles of coefficients of correlation of the density at 26 km with density at higher altitudes up to 60 km are shown for each of the mid-season months for locations in the tropics (Figure 8), middle latitudes (Figure 9), and high latitudes (Figure 10). These figures indicate that at middle and high latitudes the interlevel density correlations above 26 km decay more rapidly in winter than in the other seasons, and that seasonal variations in the decay rates in the tropics are relatively small. In April, July, and October the 26-km densities at most locations are positively correlated with the densities at nearly all levels between 26 and 60 km. At several stations, data on which to base these profiles of interlevel correlations were not available for all four mid-season months. As a result the April profile for Ascension Island is not shown in Figure 8, and the Primrose Lake and Poker Flats profiles for July and October, respectively, are not shown in Figure 10.

Profiles of coefficients of correlation, R, of surface temperatures with temperatures at other altitudes are shown in Figure 11 for each of the mid-season months at Ascension Island, Kwajalein, Wallops Island, and Churchill. At most locations, the correlation between surface temperatures and temperatures at other altitudes decreases rapidly with increasing altitude, reaching a minimum or becoming negative between 12 and 16 km and then remaining near zero, plus or minus 0.3, from 20 to 60 km. There is a pronounced negative correlation between the surface temperature at Wallops Island and temperatures at altitudes between 10 and 20 km. Values of -0.4 to -0.6 occur at these levels in January, April, and October.

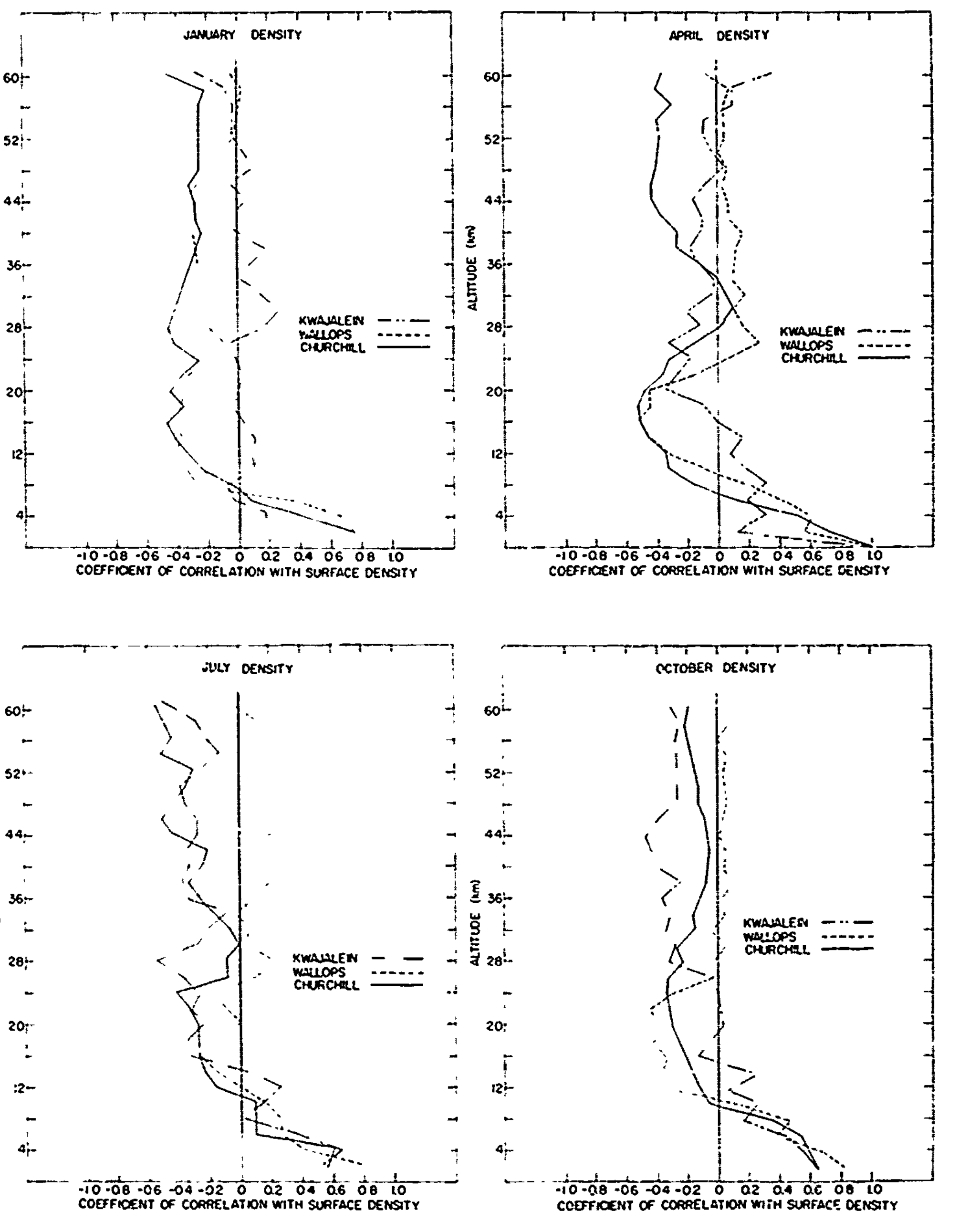

Figure 7. Vertical Profiles of Interlevel Coefficients of Correlation of Surface Density With Density at Other Altitudes up to 60 km for the Mid-Season Months at Kwajalein, Wallops Island, and Churchill

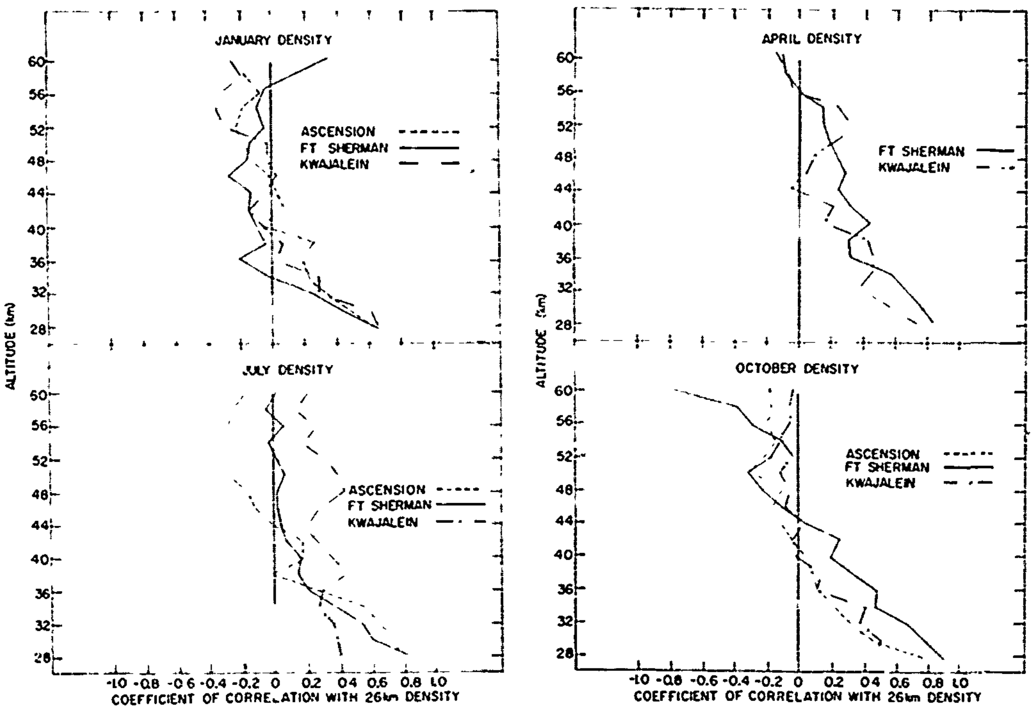

Figure 8. Vertical Profiles of Interlevel Coefficients of Correlation of Density at 26 km With Density at Higher Altitudes up to 60 km for the Mid-Season Months at Ascension Island, Fort Sherman, and Kwajalein

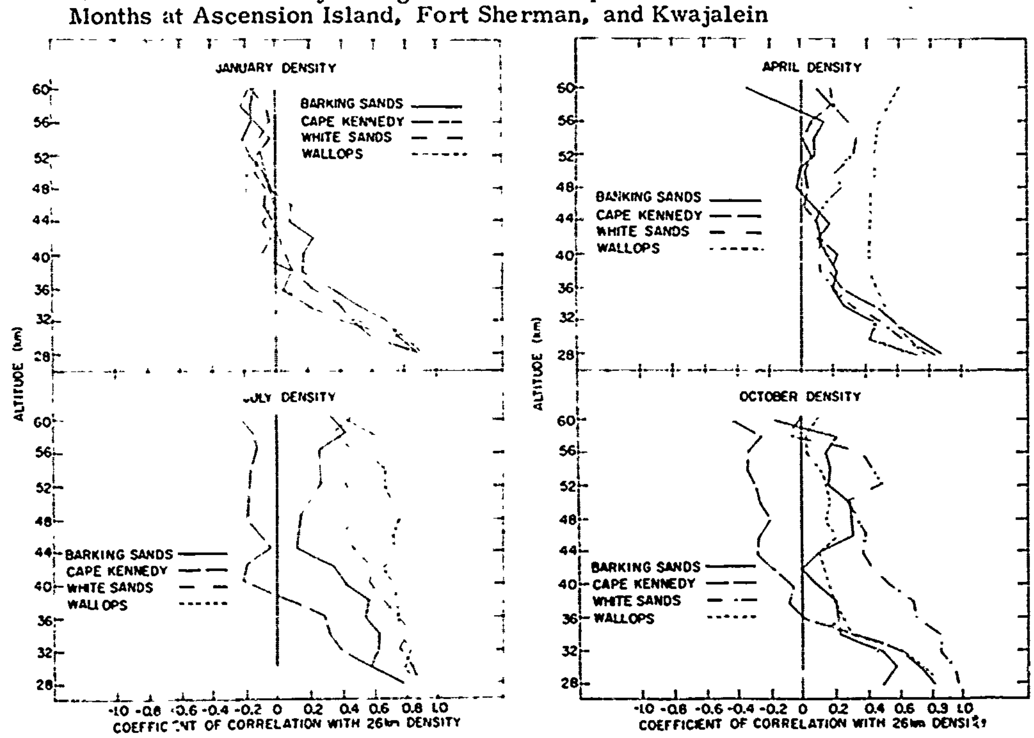

Figure 9. Vertical Profiles of Interlevel Coefficients of Correlation of Density at 26 km With Density at Higher Altitudes up to 60 km for the Mid-Season Months at Barking Sands, Cape Kennedy, White Sands, and Wallops Island

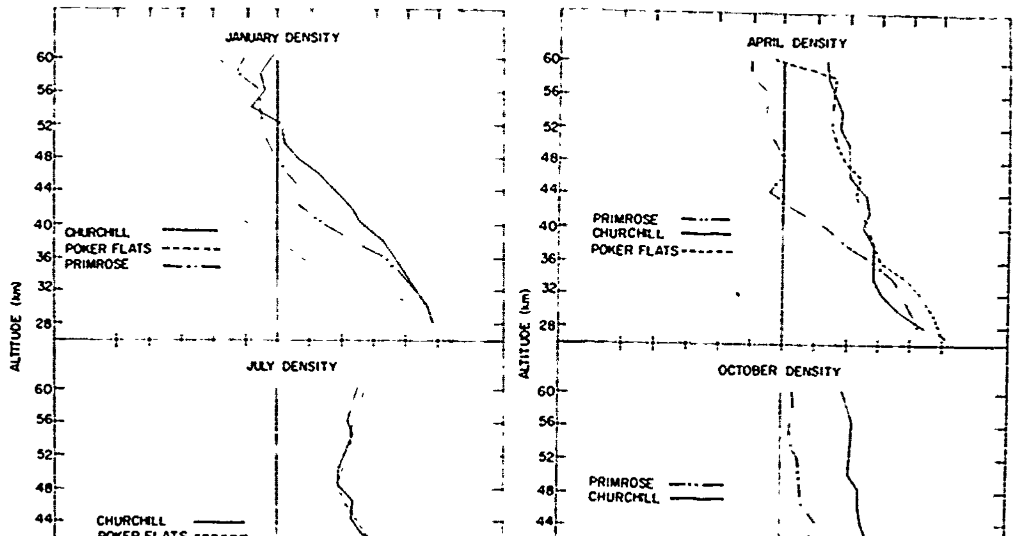

Figure 10. Vertical Profiles of Interlevel Coefficients of Correlation of Density at 26 km With Density at Higher Altitudes up to 60 km for the Mid-Season Months at Primrose Lake, Churchill, and Poker Flats

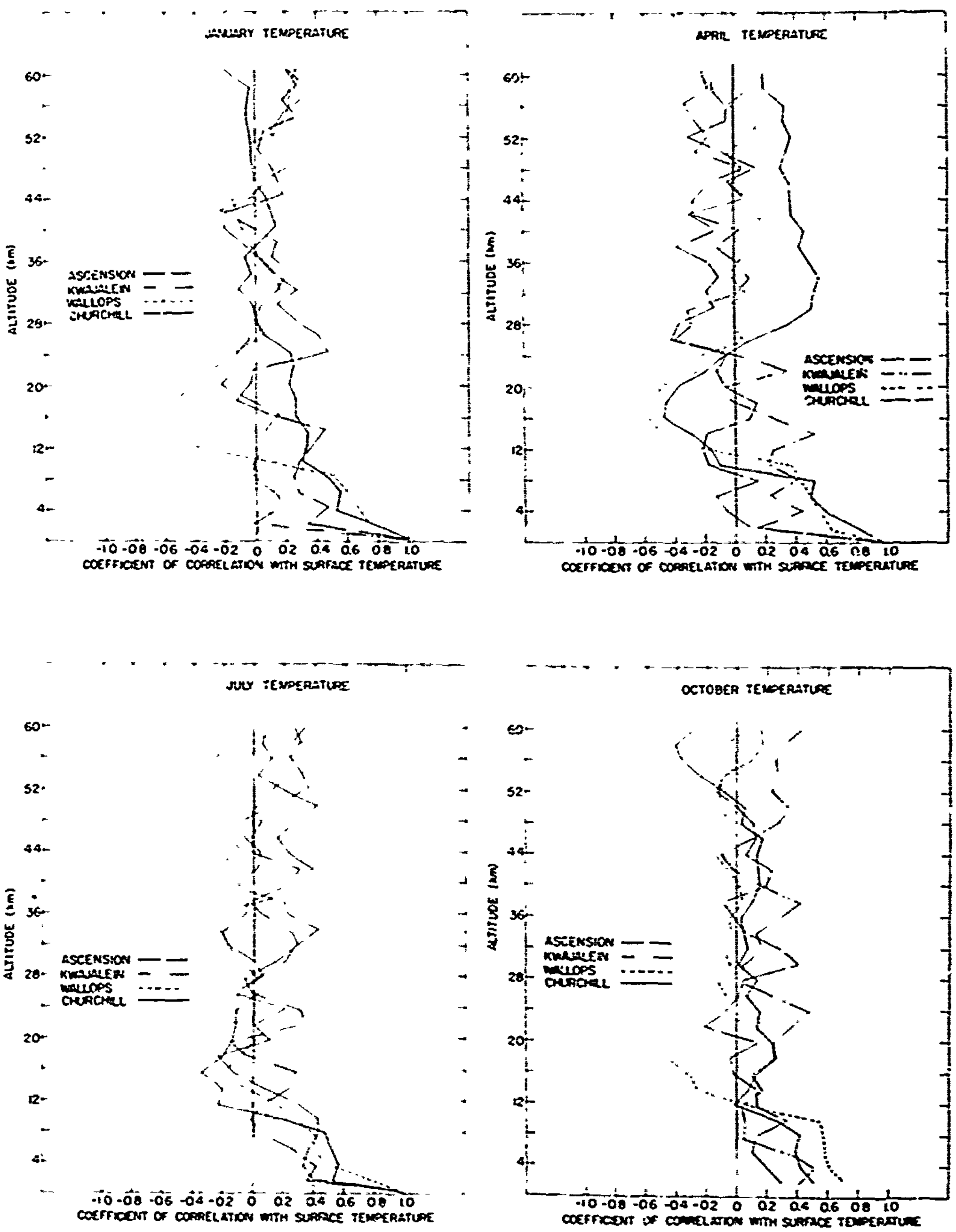

Figure 11. Vertical Profiles of Interlevel Coefficients of Correlation of Surface Temperature With Temperature at Other Altitudes up to 60 km for the Mid-Season Months at Ascension Island, Kwajalein, Wallops Island, and Churchill

Individual profiles of the correlations between temperatures at 26 km and those at other altitudes between 26 and 60 km are plotted in Figures 12, 13, and 14 for locations at low, middle, and high latitudes, respectively. The July profile for Primrose Lake is not shown in Figure 14 because only seven observations were available for the development of the interlevel correlations. The rate of decay of the interlevel correlations with increasing vertical separation between levels is approximately the same at all latitudes in July, and positive correlation exists between the values at 26 km and those of other altitudes up to 60 km. In January the rates of decay at middle and high latitudes are considerably greater than those in the tropics, and, except in the tropics, negative correlations occur at most locations when levels are separated by more than 13 to 20 km.

The individual arrays of interlevel correlations of temperatures and densities from 26 to 60 km, given in Appendices A and B for locations in tropical areas (Ascension Island, Fort Sherman, and Kwajalein), were combined to produce one set each of temperature and density matrices, Tables 2 and 3 respectively, for tropical areas. This same procedure was followed for middle latitudes (Barking Sands, Cape Kennedy, White Sands, and Wallops Island), Tables 4 and 5, and for high latitudes (Primrose Lake, Churchill, and Poker Flats), Tables 6 and 7. Combining the individual arrays increased the sample size and smoothed out many of the irregularities found in the profiles of R that are based on values from one station. The combined or average R-values of density are plotted at 2-km intervals between altitudes of 26 and 60 km, using semi-log coordinates (Figures 15, 16, and 17) for low, middle, and high latitudes, respectively. R-values of temperature are presented in the same manner in Figures 18, 19, and 20. The 26-km level was selected as the lower limit because it is near the top of observed radiosonde temperature and density profiles that are taken on a routine basis in most areas of the world. Consequently, temperatures and densities observed by radiosondes at 26 km can be used with the interlevel correlations of temperatures and densities shown in Tables 2 through 7 to extrapolate these elements to higher altitudes.

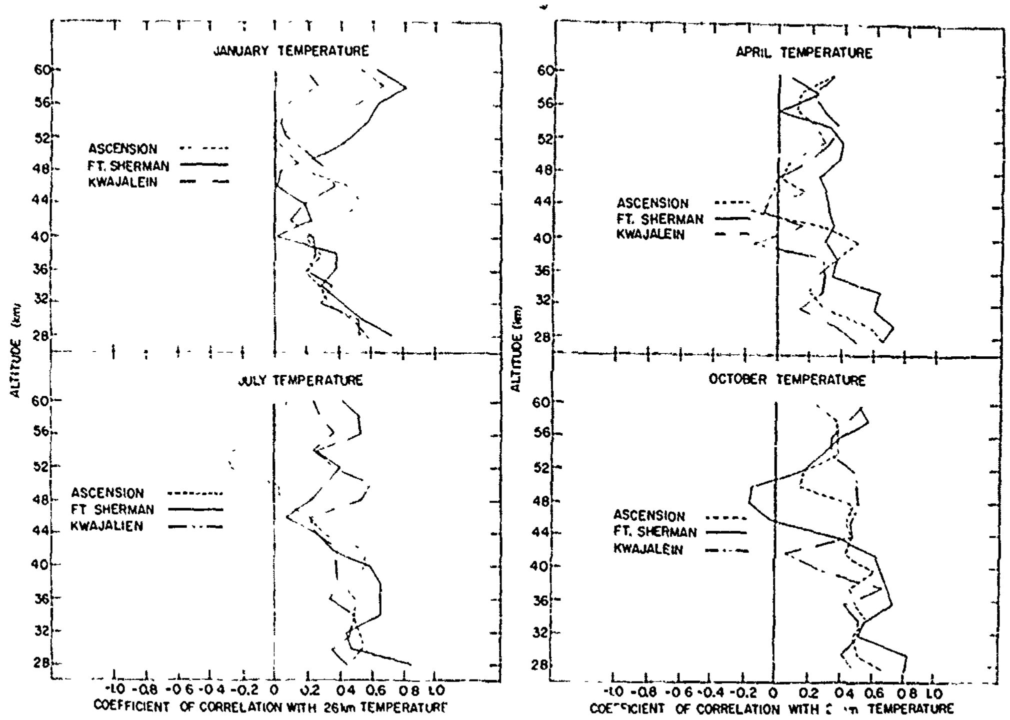

Figure 12. Vertical Profiles of Interlevel Coefficients of Correlation of Temperature at 26 km With Temperature at Higher Altitudes up to 60 km for the Mid-Season Months at Ascension Island, Fort Sherman, and Kwajalein

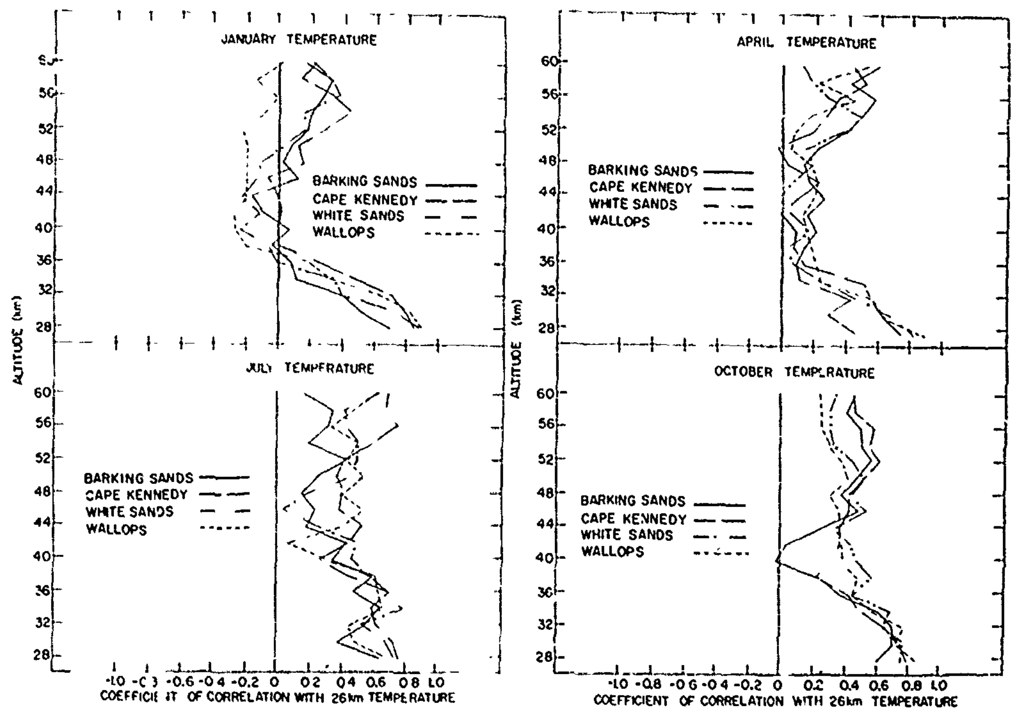

Figure 13. Vertical Profiles of Interlevel Coefficients of Correlation of Temperature at 26 km With Temperature at Higher Altitudes up to 60 km for the Mid-Season Months at Barking Sands, Cape Kennedy, White Sands, and Wallops Island

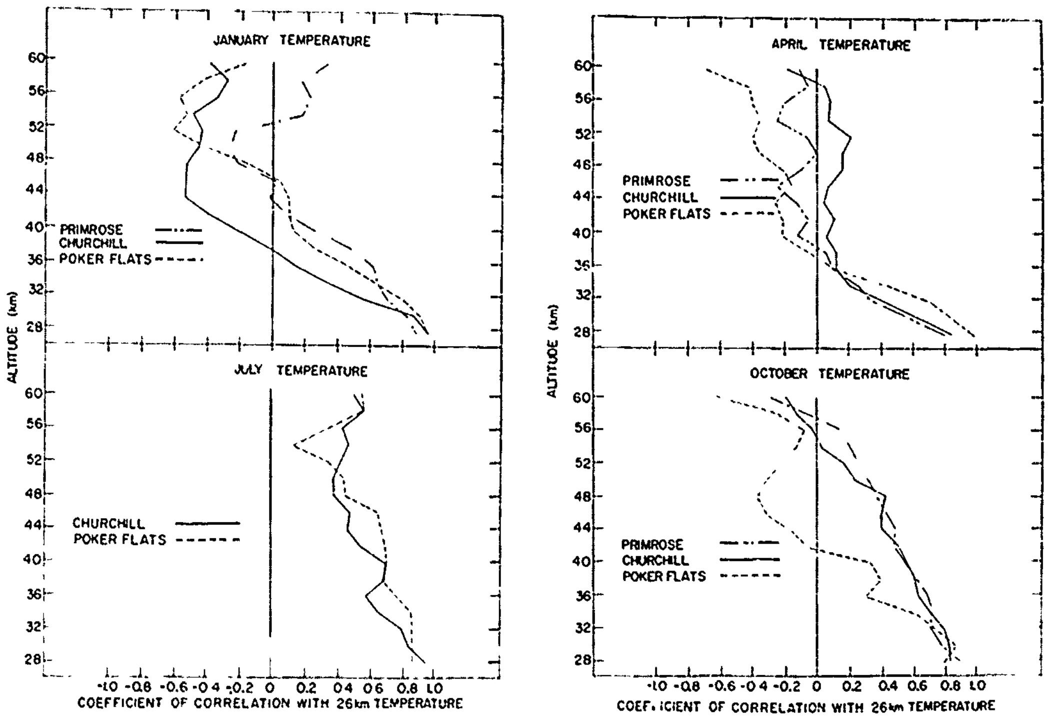

Figure 14. Vertical Profiles of Interlevel Coefficients of Correlation of Temperature at 26 km With Temperature at Higher Altitudes up to 60 km for the Mid-Season Months at Primrose Lake, Churchill, and Poker Flats

Table 2a. Average January Interlevel Correlations of Temperature for the Tropics

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	59*																
30	50	61															
32	37	36	56														
34	29	22	36	54													
36	25	26	41	50	62												
38	29	19	44	37	46	60											
40	14	18	25	12	36	32	58										
42	21	32	36	23	38	38	48	65									
44	25	18	31	19	45	28	42	40	64								
46	28	03	37	32	40	33	37	17	29	55							
48	18	12	29	32	44	33	38	25	28	40	58						
50	20	17	19	13	30	16	20	15	14	24	16	55					
52	17	24	23	20	26	16	19	07	07	16	02	35	68				
54	27	25	16	18	15	14	13	00	01	05	-06	18	39	68			
56	40	32	31	22	15	19	17	12	11	09	00	09	28	48	70		
58	57	48	47	33	21	21	30	13	19	18	14	11	34	49	61	78	
60	46	38	36	23	16	24	31	09	19	16	06	-07	26	49	62	64	84

Table 2b. Average April Interlevel Correlations of Temperature for the Tropics

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	59*																
30	54	61															
32	33	38	64														
34	36	30	39	52													
36	28	28	24	32	63												
38	33	16	32	30	44	58											
40	21	11	24	29	25	16	50										
42	26	22	12	14	28	13	07	32									
44	02	16	17	22	23	17	-10	-04	36								
46	14	05	18	30	32	32	26	17	10	24							
48	08	05	24	38	42	44	33	17	04	11	57						
50	21	10	21	33	35	43	41	21	00	13	20	50					
52	33	21	29	40	45	53	50	28	20	14	19	35	65				
54	31	28	38	34	38	52	43	28	19	13	25	35	43	67			
56	13	17	35	32	41	41	39	25	20	27	30	31	23	51	73		
58	20	23	36	34	[illegible]	51	46	31	28	26	22	35	35	56	73	88	
60	25	25	28	30	28	39	46	35	32	15	19	38	33	57	58	66	85

Table 2c. Average July Interlevel Correlations of Temperature for the Tropics

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	57*																
30	45	56															
32	47	43	64														
34	53	43	55	75													
36	49	35	49	56	73												
38	47	34	33	47	56	60											
40	50	42	41	47	49	46	58										
42	42	36	41	47	45	33	43	59									
44	26	23	30	32	28	[illegible]	20	12	47								
46	15	13	27	27	22	21	14	01	[illegible]	5							
48	26	11	27	17	19	19	09	07	[illegible]	28	[illegible]						
50	32	16	13	10	18	15	14	09	05	[illegible]	22	74					
52	20	14	10	03	15	04	16	09	12	14	19	41	63				
54	10	10	17	10	11	00	06	[illegible]	10	17	23	30	31	73			
56	27	21	24	21	19	15	15	15	13	20	18	44	38	54	74		
58	29	36	28	22	18	19	16	07	06	13	36	50	46	49	54	83	
60	21	30	33	15	10	13	15	15	22	21	29	38	42	51	54	70	84

Table 2d. Average October Interlevel Correlations of Temperature for the Tropics

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	67*																
30	59	66															
32	52	61	71														
34	55	52	56	67													
36	56	54	47	57	55												
38	61	46	41	47	46	58											
40	52	48	46	41	48	42	57										
42	37	39	34	29	32	38	33	62									
44	44	36	29	41	29	37	33	37	47								
46	28	22	21	35	28	36	25	17	24	58							
48	27	29	32	42	32	30	15	13	14	37	63						
50	15	34	17	35	25	33	17	11	15	30	44	68					
52	26	30	15	18	20	23	17	18	20	17	13	29	56				
54	32	33	23	29	27	25	17	29	22	21	20	27	33	77			
56	36	36	25	30	16	34	25	29	22	18	29	28	34	59	81		
58	44	39	29	36	26	37	35	27	26	24	34	28	34	54	66	84	
60	41	44	25	33	44	35	31	23	30	32	47	41	51	50	54	65	82

*Multiply tabular values by 0.01 to obtain correlation coefficients.

Table 3a. Average January Interlevel Correlations of Density for the Tropics

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	65*																
30	51	56															
32	30	33	63														
34	17	18	43	62													
36	01	13	37	47	61												
38	11	09	33	43	48	61											
40	-13	-04	09	16	35	44	65										
42	-06	09	17	24	34	48	57	77									
44	-03	02	17	27	40	43	53	64	83								
46	-07	-07	19	31	31	41	44	48	65	84							
48	-09	-02	09	30	29	36	39	47	59	75	83						
50	-10	-04	05	21	23	32	28	47	56	69	69	79					
52	-18	-05	01	17	13	32	31	45	61	72	72	74	85				
54	-20	-14	-08	14	03	26	29	44	60	68	71	68	72	90			
56	-14	-17	-11	11	02	24	25	44	58	62	66	58	60	79	90		
58	02	-05	-07	11	01	21	34	42	60	67	67	54	57	78	87	92	
60	-26	-25	-21	00	00	42	36	42	64	66	70	60	52	79	86	85	92

Table 3b. Average April Interlevel Correlations of Density for the Tropics

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	70*																
30	57	68															
32	40	51	72														
34	29	35	48	70													
36	23	32	37	59	77												
38	20	20	40	55	59	68											
40	18	27	40	58	48	47	72										
42	08	23	26	47	51	49	50	74									
44	-04	18	28	46	46	54	50	64	78								
46	-04	03	20	46	44	50	56	63	66	81							
48	-03	08	25	47	46	53	58	63	64	74	85						
50	03	13	25	44	46	55	65	70	66	76	80	89					
52	06	15	26	46	49	59	65	67	67	73	73	79	91				
54	02	17	28	42	38	50	57	64	65	75	78	80	85	89			
56	-14	00	18	33	31	34	47	59	59	71	70	69	73	73	85		
58	-16	03	14	31	30	35	51	61	61	67	68	69	73	72	80	92	
60	-10	15	09	35	32	40	53	69	67	64	65	72	76	76	52	77	89

Table 3c. Average July Interlevel Correlations of Density for the Tropics

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	66*																
30	45	63															
32	51	41	54														
34	40	37	44	62													
36	22	20	23	32	55												
38	19	14	06	16	33	62											
40	23	13	05	09	21	54	66										
42	17	18	11	14	28	59	65	81									
44	08	12	04	08	24	60	59	67	85								
46	05	11	07	07	22	56	59	65	77	92							
48	09	05	01	02	24	54	53	66	72	81	86						
50	06	05	-07	-02	16	50	53	66	73	78	79	90					
52	03	01	-06	-03	14	49	58	70	76	77	79	82	91				
54	-03	-03	-08	-01	10	49	77	73	77	78	78	75	82	92			
56	01	-01	-12	-01	08	19	55	73	76	78	78	78	81	84	91		
58	-03	02	-02	06	11	46	50	65	71	69	74	75	76	76	79	93	
60	02	11	15	05	15	53	60	72	80	73	70	73	72	74	78	87	91

Table 3d. Average October Interlevel Correlations of Density for the Tropics

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	72*																
30	45	58															
32	46	59	52														
34	37	38	31	63													
36	25	29	22	50	69												
38	19	16	13	41	60	69											
40	08	17	15	36	64	60	71										
42	06	21	14	42	64	66	66	86									
44	-02	07	08	38	58	62	63	73	82								
46	-11	-02	-03	30	[illegible]	60	61	69	78	88							
48	-13	00	-01	27	48	54	60	69	72	81	89						
50	-23	-02	-04	21	50	55	58	73	74	77	80	87					
52	-14	-01	-05	18	52	54	62	71	74	76	82	86	89				
54	-12	-01	-06	19	52	55	63	74	77	78	84	85	86	95			
56	-18	-06	-02	14	46	52	63	71	73	75	84	83	86	92	96		
58	-21	-04	-01	17	47	50	62	68	72	75	85	82	84	90	91	95	
60	-34	-21	-15	01	20	29	44	31	33	61	79	77	68	82	84	90	95

*Multiply tabular values by 0.01 to obtain correlation coefficients.

Table 4a. Average January Interlevel Correlations of Temperature for Middle Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	80*																
30	66	79															
32	51	59	75														
34	29	43	58	76													
36	10	23	36	53	71												
38	-10	-02	04	22	42	73											
40	-12	00	01	14	36	50	75										
42	-14	-04	02	07	25	36	56	73									
44	-13	-06	-03	06	16	23	44	55	74								
46	-09	00	-02	-01	04	13	35	42	51	75							
48	-05	02	00	04	10	21	30	38	49	56	71						
50	00	05	10	10	13	20	25	26	32	38	48	75					
52	09	18	16	11	12	16	19	16	13	11	19	33	64				
54	17	30	21	23	21	28	18	08	03	00	00	05	26	69			
56	24	34	17	22	21	17	08	02	00	06	07	07	16	48	80		
58	16	24	10	05	03	04	-01	00	06	10	17	18	33	48	69	82	
60	15	19	10	02	00	01	09	-09	02	07	12	17	35	38	49	59	85

Table 4b. Average April Interlevel Correlations of Temperature for Middle Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	72*																
30	58	73															
32	51	56	69														
34	29	39	53	68													
36	14	16	33	47	63												
38	12	08	18	33	40	72											
40	17	06	08	21	26	33	55										
42	10	00	-04	-03	-04	06	28	56									
44	14	10	00	-05	-04	-02	16	37	68								
46	17	06	00	-08	-05	00	18	25	35	62							
48	14	01	-05	-07	-04	-02	14	28	30	42	67						
50	10	03	02	04	00	01	20	43	35	45	50	64					
52	26	11	06	05	02	01	18	39	45	50	43	42	71				
54	34	22	20	22	15	13	27	40	41	46	42	39	55	75			
56	41	22	23	27	20	19	31	40	40	46	42	38	41	55	80		
58	33	24	22	25	20	16	24	41	42	48	31	24	38	51	70	81	
60	41	31	23	25	12	13	19	35	32	34	31	24	38	53	66	67	81

Table 4c. Average July Interlevel Correlations of Temperature for Middle Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	70*																
30	56	70															
32	52	55	66														
34	46	61	58	69													
36	60	58	50	54	66												
38	54	62	47	46	51	56											
40	32	43	38	45	38	35	57										
42	34	38	48	54	46	43	31	56									
44	32	41	44	44	41	36	27	17	52								
46	28	34	39	30	34	28	41	04	23	71							
48	27	36	39	43	37	31	21	08	22	42	61						
50	39	44	46	50	50	40	31	23	29	27	33	76					
52	44	47	43	47	49	44	33	27	31	22	17	43	73				
54	43	46	42	46	50	48	36	33	32	20	12	26	54	84			
56	44	45	33	40	45	52	40	30	26	23	12	13	33	57	82		
58	46	44	28	28	48	47	34	24	22	29	23	20	28	48	70	86	
60	52	55	39	28	58	54	41	24	24	34	33	25	32	42	58	72	89

Table 4d. Average October Interlevel Correlations of Temperature for Middle Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	76*																
30	75	76															
32	70	72	84														
34	61	58	65	78													
36	44	46	54	63	70												
38	40	42	45	57	65	74											
40	29	35	32	42	51	61	72										
42	31	36	37	40	48	52	60	66									
44	34	36	33	39	43	42	53	46	67								
46	46	44	39	42	48	50	56	50	61	76							
48	40	42	36	40	43	48	46	48	52	56	79						
50	49	44	44	44	48	45	46	43	48	50	66	83					
52	51	40	48	46	47	47	46	36	47	52	68	69	77				
54	43	37	42	38	42	44	37	27	41	47	62	60	64	85			
56	42	36	41	35	40	40	34	20	36	45	54	53	56	72	35		
58	36	40	43	37	40	48	42	30	40	43	58	57	58	67	78	88	
60	38	44	47	43	43	49	44	34	43	50	58	53	60	60	64	75	80

*Multiply tabular values by 0.01 to obtain correlation coefficients.

Table 5a. Average January Interlevel Correlations of Density for Middle Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	84*																
30	69	81															
32	48	57	71														
34	30	42	57	80													
36	14	25	41	62	81												
38	-05	04	19	45	68	86											
40	-14	-02	12	32	58	66	82										
42	-01	02	16	29	50	58	69	83									
44	-08	-06	06	21	37	44	56	68	85								
46	-06	09	-02	10	22	34	44	56	70	88							
48	-09	-12	-06	05	17	28	34	45	63	76	89						
50	-12	-17	-06	03	10	19	24	33	49	65	79	90					
52	-17	-19	-11	-04	05	18	15	25	38	54	67	76	91				
54	-16	-17	-14	-02	03	09	11	17	32	48	59	67	80	90			
56	-14	-18	-17	-02	05	07	09	17	32	52	62	69	77	83	94		
58	-19	-24	-14	-02	02	14	18	29	46	62	71	77	85	83	89	93	
60	-25	-29	-19	-09	03	14	19	32	51	65	72	75	83	82	86	88	96

Table 5b. Average April Interlevel Correlations of Density for Middle Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	79*																
30	59	73															
32	52	57	73														
34	37	47	62	78													
36	28	34	54	66	84												
38	23	29	44	58	74	89											
40	23	27	34	49	65	71	80										
42	18	23	29	39	54	65	76	81									
44	19	25	29	37	54	62	71	78	90								
46	17	20	27	37	54	62	71	75	80	90							
48	17	21	29	39	55	60	67	74	75	84	93						
50	17	22	32	43	56	61	68	74	75	82	88	93					
52	23	26	32	42	56	60	65	71	75	80	84	85	92				
54	22	25	33	44	56	62	65	68	72	78	83	84	88	93			
56	25	25	35	46	57	64	64	66	69	75	80	81	82	88	94		
58	21	26	33	43	56	60	60	65	70	73	77	78	81	87	80	92	
60	13	15	26	44	52	59	54	56	57	61	74	77	81	86	87	84	92

Table 5c. Average July Interlevel Correlations of Density for Middle Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	85*																
30	72	79															
32	66	66	78														
34	64	66	67	75													
36	59	61	64	69	81												
38	51	60	61	68	73	86											
40	38	49	56	63	65	70	83										
42	35	39	54	63	66	74	73	83									
44	31	35	47	54	61	67	68	66	83								
46	28	30	45	51	61	66	69	66	78	93							
48	27	30	45	56	62	70	70	70	81	82	89						
50	29	33	46	56	63	71	72	73	79	74	80	93					
52	28	31	42	52	60	68	70	73	77	70	74	84	[illegible]				
54	30	32	41	49	59	70	72	74	78	71	73	79	87	95			
56	27	31	34	41	55	68	69	69	72	72	72	74	79	83	91		
58	30	31	35	45	62	68	72	72	74	79	78	74	77	81	86	94	
60	21	26	36	44	61	68	73	73	74	73	78	74	77	78	83	89	94

Table 5d. Average October Interlevel Correlations of Density for Middle Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	76*																
30	74	73															
32	60	61	75														
34	40	42	54	76													
36	28	30	46	64	74												
38	24	24	39	60	72	80											
40	17	28	30	49	60	72	84										
42	09	19	24	35	48	61	74	87									
44	07	14	17	31	41	52	67	77	86								
46	15	20	21	33	42	53	65	77	83	89							
48	13	19	21	34	42	53	63	78	80	82	92						
50	12	15	22	33	38	48	60	76	79	81	87	94					
52	12	13	23	32	36	47	60	72	77	80	87	88	93				
54	09	10	20	29	34	43	54	68	74	79	83	84	90	96			
56	05	09	17	26	33	40	52	66	71	76	79	82	88	92	96		
58	-03	06	15	25	33	42	56	70	75	73	77	83	87	88	91	94	
60	-14	-06	08	22	26	31	50	65	68	73	69	74	84	83	85	88	90

*Multiply tabular values by 0.01 to obtain correlation coefficients.

Table 6a. Average January Interlevel Correlations of Temperature for High Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	93*																
30	87	94															
32	69	80	90														
34	53	67	77	92													
36	40	54	64	83	92												
38	24	38	48	69	83	92											
40	07	20	29	53	70	82	93										
42	-07	10	18	43	62	74	87	93									
44	-15	-02	06	30	49	63	78	84	91								
46	-15	-03	01	23	42	55	70	78	83	93							
48	-29	-23	-19	03	20	32	51	60	68	83	89						
50	-37	-32	-31	-15	02	15	36	45	54	70	76	92					
52	-42	-45	-47	-35	-19	-07	09	18	25	44	54	74	89				
54	-27	-37	-44	-44	-35	-26	-17	-09	-06	09	25	40	61	84			
56	-22	-37	-43	-49	-46	-41	-33	-27	-25	-12	03	20	40	68	89		
58	-18	-31	-40	-52	-54	-55	-48	-46	-44	-37	-27	-10	12	43	72	92	
60	-07	-22	-31	-45	-52	-56	-49	-54	-53	-45	-32	-19	-01	23	53	74	91

Table 6b. Average April Interlevel Correlations of Temperature for High Latitudes

km	26	28	30	32	34	36	38	40	42.	44	46	48	50	52	54	56	58
28	85*																
30	68	84															
32	48	67	88														
34	29	49	71	89													
36	10	29	47	71	83												
38	04	17	37	46	76	92											
40	-09	05	24	50	69	85	92										
42	-06	04	17	43	63	77	83	92									
44	-12	03	15	40	58	74	82	89	93								
46	-11	06	19	44	60	75	81	88	88	90							
48	-05	04	17	43	56	72	78	84	85	83	88						
50	-07	-01	09	33	49	62	70	78	81	82	81	92					
52	-05	-01	06	29	44	56	63	72	74	77	78	84	91				
54	-18	-08	00	23	39	50	57	64	67	69	73	77	80	88			
56	-17	-09	01	23	39	47	51	58	59	59	62	69	72	81	91		
58	-14	-09	-04	19	25	42	44	54	61	59	62	68	74	79	82	89	
60	-33	-30	-19	03	20	28	29	43	48	41	47	50	62	61	68	75	87

Table 6c. Average July Interlevel Correlations of Temperature for High Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	86*																
30	72	7.															
32	72	68	79														
34	64	60	75	85													
36	57	54	75	74	76												
38	67	58	62	80	72	75											
40	47	48	59	70	73	65	72										
42	38	41	52	64	73	45	53	76									
44	49	45	44	48	51	48	47	43	50								
46	37	31	40	45	54	48	51	56	54	74							
48	47	43	51	56	68	67	67	68	50	40	56						
50	46	42	57	73	62	69	67	58	37	35	32	84					
52	40	35	45	71	59	64	64	58	39	37	32	76	94				
54	38	31	15	53	42	40	54	43	30	19	18	62	70	82			
56	42	40	32	59	53	56	56	54	32	22	22	71	76	87	89		
58	57	55	47	71	57	50	63	57	33	34	32	65	72	80	81	88	
60	46	47	32	61	49	41	54	56	30	38	36	65	67	73	70	80	91

Table 6d. Average October Interlevel Correlations of Temperature for High Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	85*																
30	82	89															
32	75	80	93														
34	67	73	85	92													
36	54	64	76	55	89												
38	51	60	71	80	85	87											
40	49	53	64	74	77	79	93										
42	31	38	44	56	66	69	82	86									
44	24	32	37	51	62	65	77	80	91								
46	16	25	23	39	48	52	63	64	82	88							
48	13	23	22	34	44	49	57	58	73	81	92						
50	08	15	15	24	33	32	47	51	67	71	79	87					
52	07	09	09	17	29	21	41	48	63	65	71	77	91				
54	03	08	08	20	27	23	33	39	48	48	55	59	69	81			
56	02	-01	-01	09	14	12	22	31	37	35	39	47	53	67	82		
58	-15	-11	-12	-03	03	09	14	16	21	28	32	41	46	56	71	89	
60	-37	05	-28	-30	-13	-06	-30	-28	15	17	28	33	37	30	50	62	85

*Multiply tabular values by 0.01 to obtain correlation coefficients.

Table 7a. Average January Interlevel Correlations of Density for High Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	96*																
30	92	97															
32	86	94	97														
34	78	89	93	98													
36	72	84	88	94	98												
38	61	74	80	86	92	96											
40	49	65	72	79	86	92	97										
42	41	58	65	72	80	87	93	97									
44	37	52	60	66	74	81	90	93	98								
46	30	45	52	58	66	73	82	87	93	97							
48	22	37	43	50	57	65	75	81	89	94	98						
50	14	28	35	40	47	55	66	73	82	88	94	98					
52	10	24	29	32	26	44	53	60	71	78	86	91	95				
54	01	15	22	23	29	36	51	53	64	73	81	90	96	95			
56	03	12	20	19	23	28	37	46	58	67	78	87	93	93	99		
58	-04	07	15	15	20	26	36	46	58	65	76	84	90	91	96	99	
60	-01	12	19	19	24	27	33	45	57	62	69	77	83	35	91	94	98

Table 7b. Average April Interlevel Correlations of Density for High Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	92																
30	83	93															
32	76	87	94														
34	69	80	85	94													
36	59	69	76	84	93												
38	53	60	65	73	84	93											
40	45	52	54	64	76	88	95										
42	39	41	42	48	63	75	86	93									
44	32	34	34	37	50	64	77	84	95								
46	31	33	32	33	44	58	70	78	88	95							
48	28	27	25	25	35	49	63	72	84	92	97						
50	24	21	19	[illegible]	27	41	54	64	79	89	94	98					
52	18	15	13	10	19	33	47	57	74	86	93	96	98				
54	19	16	14	09	18	31	44	52	70	83	91	95	97	99			
56	17	14	11	07	14	26	38	46	64	78	87	93	95	98	99		
58	12	06	04	-02	06	20	33	42	62	78	85	90	94	97	97	98	
60	00	05	03	02	11	26	39	49	65	76	86	90	93	93	96	97	99

Table 7c. Average July Interlevel Correlations of Density for High Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	94*																
30	88	90															
32	81	88	86														
34	71	80	82	94													
36	51	61	66	88	80												
38	46	59	52	76	72	83											
40	42	54	44	68	68	74	88										
42	26	42	38	64	64	68	78	88									
44	13	28	26	54	55	70	74	80	92								
46	11	25	22	52	52	72	78	77	80	92							
48	07	20	20	50	51	73	72	74	76	85	94						
50	03	20	25	49	45	65	68	66	70	78	52	92					
52	06	15	19	44	42	62	68	68	75	80	30	88	96				
54	08	18	18	48	44	67	74	72	79	84	85	88	91	96			
56	00	10	10	42	44	65	72	75	82	88	90	88	85	87	96		
58	08	12	10	40	45	60	62	72	82	91	88	83	76	80	89	96	
60	06	15	10	76	42	62	62	81	83	92	90	83	73	73	87	96	99

Table 7d. Average October Interlevel Correlations of Density for High Latitudes

km	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58
28	84																
30	73	90															
32	64	80	92														
34	60	73	86	94													
36	51	65	76	87	93												
38	44	55	69	83	91	96											
40	38	48	63	79	85	92	97										
42	36	44	59	75	82	91	95	98									
44	36	42	55	71	78	89	93	95	98								
46	31	38	50	66	72	83	90	93	96	98							
48	31	37	50	64	70	81	87	91	94	97	98						
50	26	33	45	59	66	78	84	88	92	95	97	99					
52	27	34	45	59	65	76	82	86	90	94	96	98	99				
54	25	33	44	56	61	74	79	83	87	91	94	97	98	98			
56	25	32	43	55	58	72	76	81	85	89	92	95	97	98	99		
58	25	34	43	56	59	71	77	83	87	90	93	96	97	98	98	99	
60	24	35	43	54	60	70	77	82	85	89	92	95	96	96	97	98	99

*Multiply tabular values by 0.01 to obtain correlation coefficients.

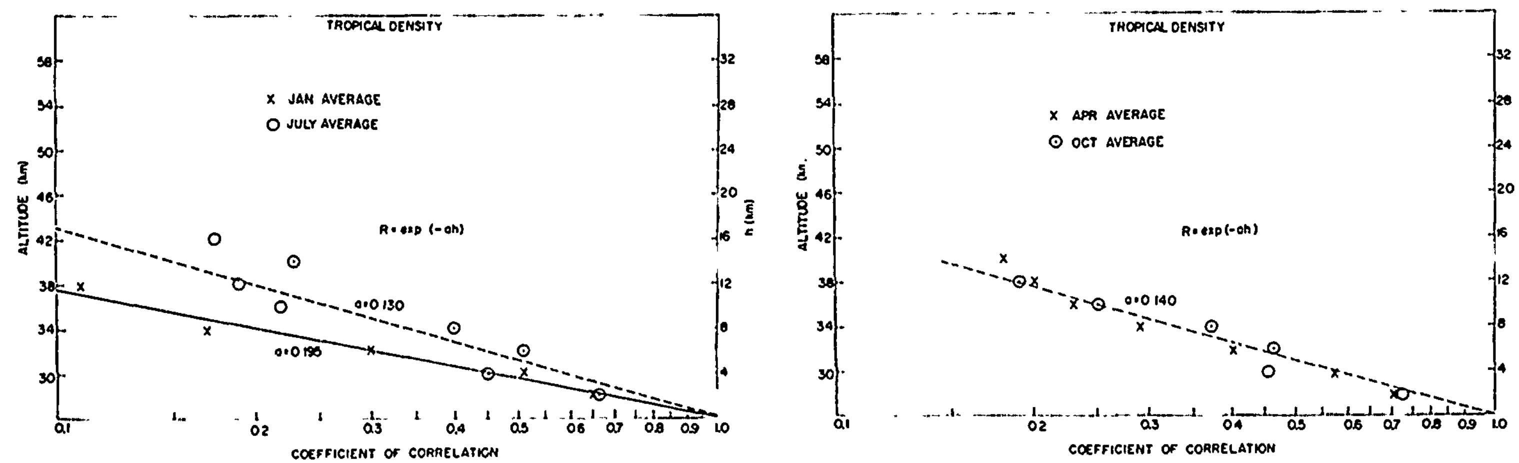

Figure 15. Interlevel Coefficients of Correlation of Density at 26 km With Density at Higher Altitudes for the Mid-Season Months in the Tropics

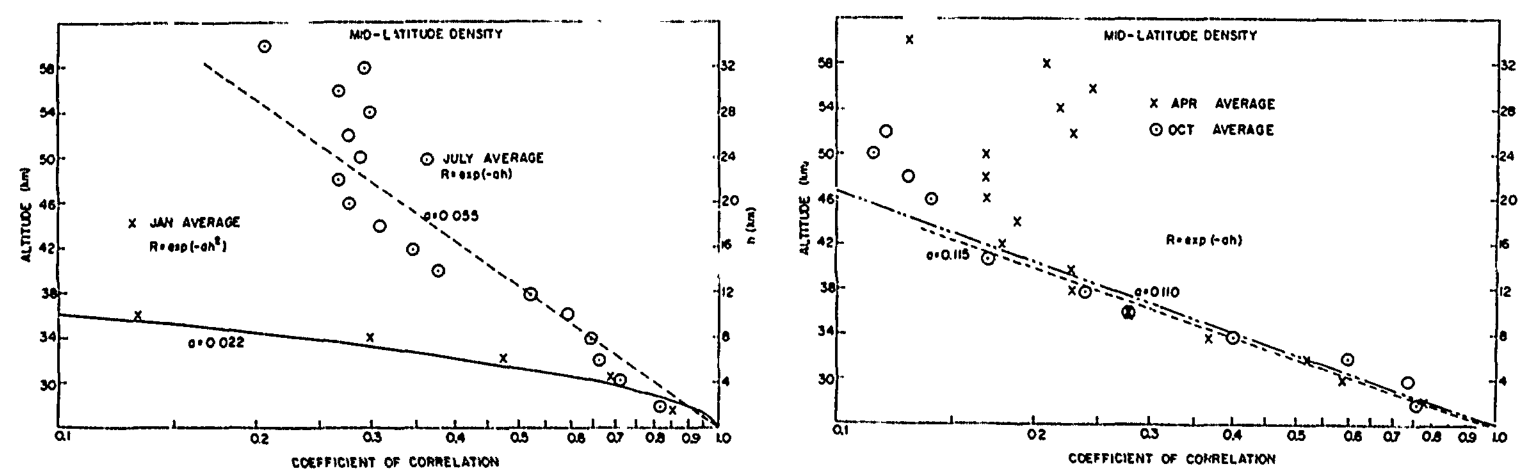

Figure 16. Interlevel Coefficients of Correlation of Density at 26 km With Density at Higher Altitudes for the Mid-Season Months in Middle Latitudes

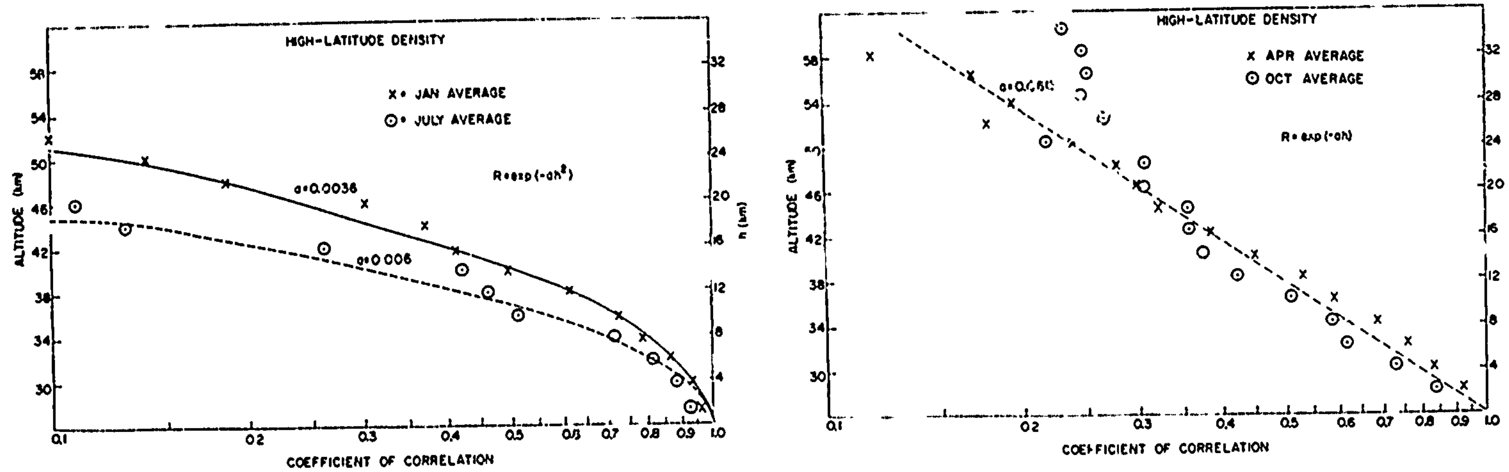

Figure 17. Interlevel Coefficients of Correlation of Density at 26 km With Density at Higher Altitudes for the Mid-Season Months in High Latitudes

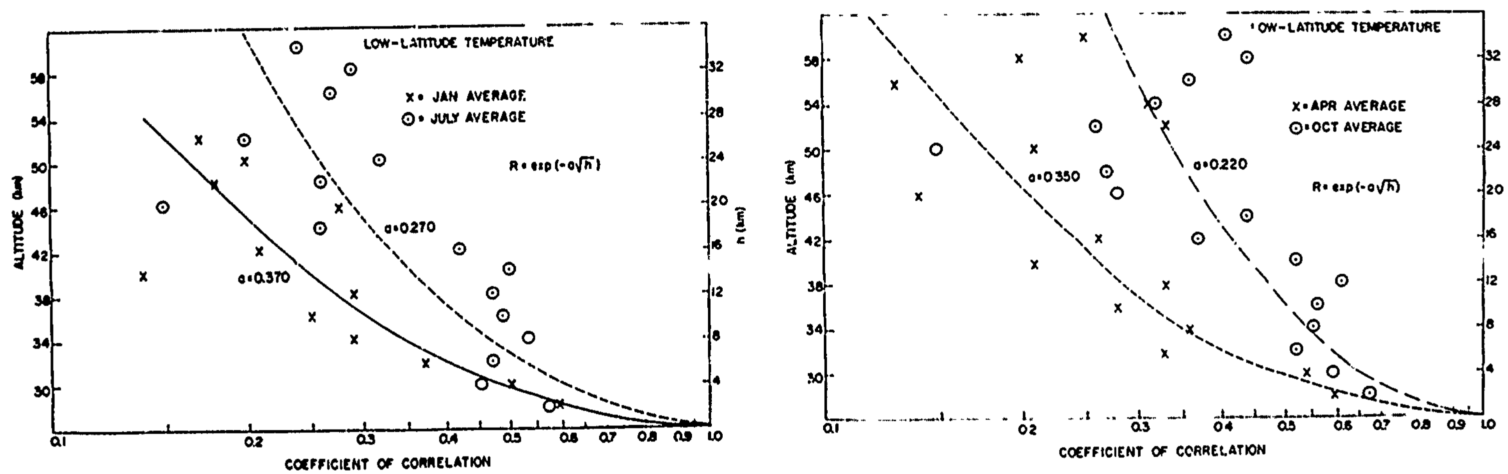

Figure 18. Interlevel Coefficients of Correlations of Temperature at 26 km With Temperature at Higher Altitudes for the Mid-Season Months in the Tropics

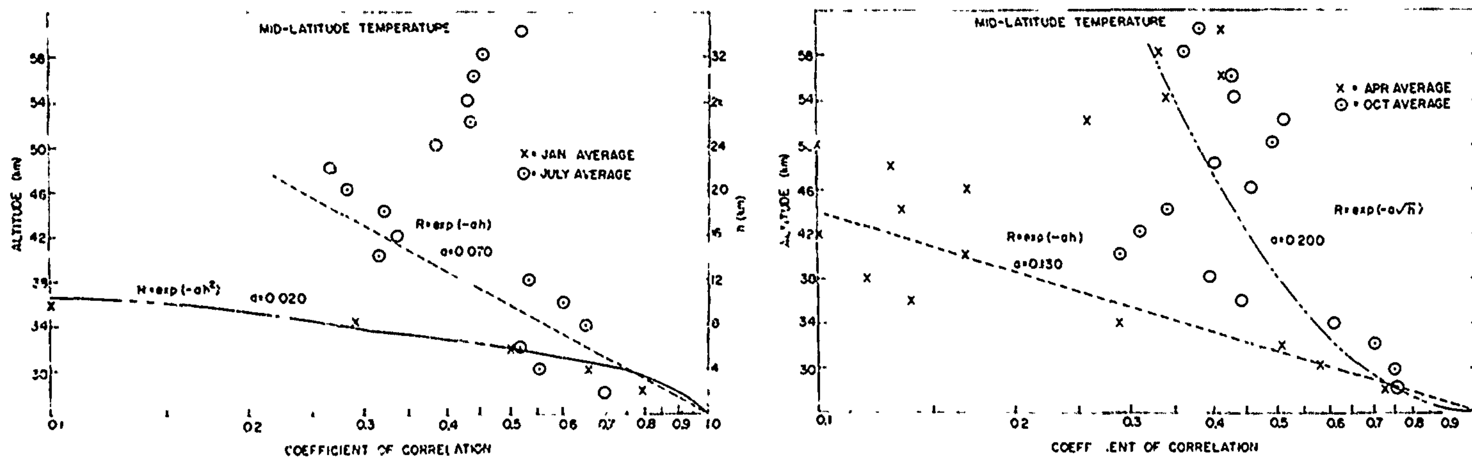

Figure 19. Interlevel Coefficients of Correlations of Temperature at 26 km With Temperature at Higher Altitudes for the Mid-Season Months in Middle Latitudes

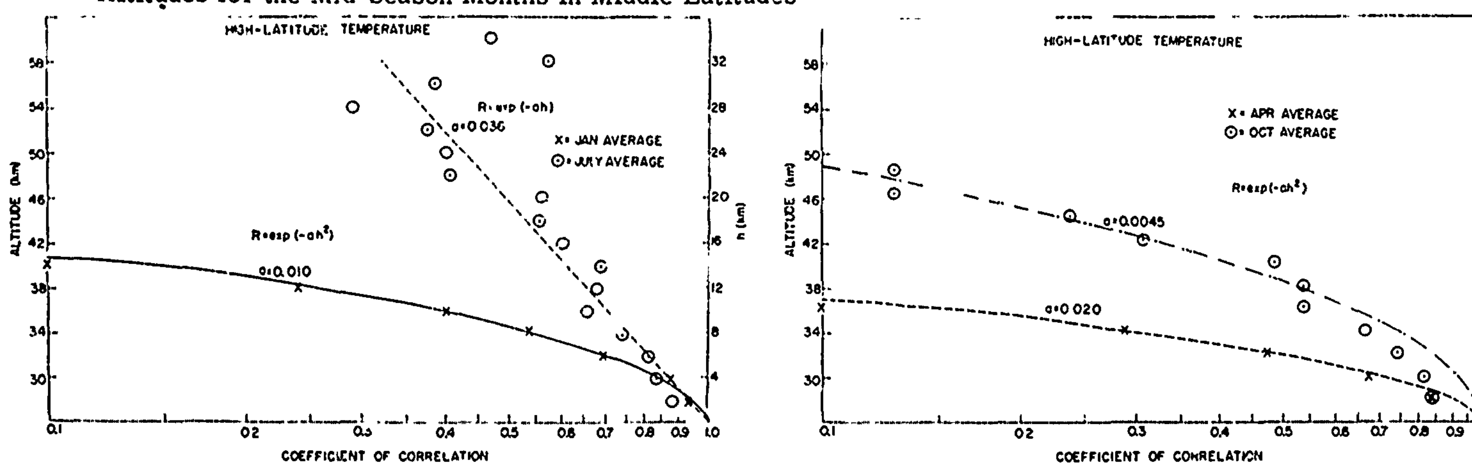

Figure 20. Interlevel Coefficients of Correlations of Temperature at 26 km With Temperature at Higher Altitudes for the Mid-Season Months in High Latitudes

The decay of the interlevel correlations of both temperatures and densities between values at 26 km and those at higher altitudes, Figures 15 through 20, can be defined by a simple expression of the type:

$$R = \exp(-ah), \tag{4}$$

where a is a constant and h is the vertical separation in kilometers. However, several of the curves were better defined by modified versions of the same expression:

$$R = \exp(-ah^2) \tag{5}$$

and

$$R = \exp(-a\sqrt{h}). \tag{6}$$

It was found that the value of the constant "a" in these equations, which are generally valid for thicknesses of 12 to 20 km, changed with season and latitude, as shown in Table 8 and in Figures 15 through 20.

Table 8. Seasonal and Latitudinal Changes in "a" (used for defining correlation decay)

	Density		
	High Latitude	Middle Latitude	Low Latitude
Jan	$0.0036h^2$	$0.022h^2$	$0.195h$
Apr	$0.060h$	$0.115h$	$0.140h$
July	$0.006h^2$	$0.055h$	$0.130h$
Oct	$0.060h$	$0.110h$	$0.140h$
	Temperature		
Jan	$0.010h^2$	$0.020h^2$	$0.370\sqrt{h}$
Apr	$0.020h^2$	$0.130h$	$0.350\sqrt{h}$
July	$0.036h$	$0.070h$	$0.270\sqrt{h}$
Oct	$0.0045h^2$	$0.20\sqrt{h}$	$0.220\sqrt{h}$

If density observations on a specific day extend only to an altitude of 26 km, the usual peak altitude of a radiosonde, ar estimated density profile can be obtained from 28 to 60 km by using the appropriate monthly means, standard deviations, and interlevel correlations in the general expression:

$$\hat{\rho}_2 = \bar{\rho}_2 + R\frac{\sigma_2}{\sigma_1}(\rho_1 - \bar{\rho}_1)\ , \qquad (7)$$

where $\hat{\rho}_2$ is the estimated density at the desired level, ρ_1 is the density at the lower level, ρ_2 is the density at the upper level, σ_1 is the standard deviation of ρ_1, σ_2 is the standard deviation of ρ_2, and R is the coefficient of correlation of density between the two levels.

The effect of density on the trajectory and impact point of a missile can be estimated through use of Eqs. (1) and (2). The mean effect, E, can be determined from Eq. (1) for a particular location or region, using the mean monthly densities from the appropriate array in Appendix B and the influence coefficients for a given missile at the various levels of interest. The standard deviation around the mean monthly effects of density due to day-to-day variations in the density profile can be estimated from Eq. (2). An arithmetic example, given in Appendix C, illustrates the use of Eqs. (1) and (2) along with the statistical arrays from Appendix B.

6. VERTICAL DENSITY GRADIENTS

The largest changes of density with altitude occur in layers that have a low base temperature and a large positive vertical temperature gradient. Consequently, the largest mean monthly vertical density gradients below 30 km occur in the layer immediately above the tropical tropopause where temperatures increase rapidly with altitude from tropospheric and stratospheric minima near 190°K. Vehicles descending through this region would encounter a 44- to 51-percent increase in density through a 2-km layer (Tables B1 and B2). The largest density gradients above 30 km within the stratosphere and lower mesosphere generally occur between 30 and 40 km in arctic and subarctic regions in January, when temperatures are lowest near 30 km and increase with altitude up to 45 or 50 km. This can be even more significant in winter during a "stratospheric warming" in which the temperature in the lower stratosphere decreases while the temperature in the upper stratosphere increases by 30 or 40°K.[6]

6. Kantor, A. J., and Cole, A. E. (1977) Monthly 90° N Atmospheres and High-Latitude Warm and Cold Winter Stratosphere/Mesosphere, AFGL-TR-77-0289, AD A051421.

Mean monthly vertical density gradients for 2-km increments of altitude may be extracted from the statistical arrays given for 10 locations in Appendix B. More importantly, the variance of density gradients associated with the day-to-day variations in synoptic weather conditions can be estimated (from the appropriate means, standard deviations, and coefficients of correlation) using the fundamental relationship:

$$\hat{\sigma}^2 = \sigma_1^2 + \sigma_2^2 - 2 R \sigma_1 \sigma_2 , \qquad (8)$$

where σ_1^2 is the mean monthly density variance at level 1, σ_2^2 is the variance at level 2, R is the coefficient of correlation of density between values at levels 1 and 2, and $\hat{\sigma}^2$ is the estimated variance around the mean monthly gradient between these levels. A sample computation for Churchill in January is given in Appendix D for a vertical density gradient that is equalled or exceeded 2.5 percent of the time.

References

1. Cole, A. E., and Court, A. (1962) Density Distribution, Interlevel Correlations, and Variation with Winds, AFCRL-TR-62-815.
2. Cole, A. E., and Nee, P. F. (1965) Correlations of Temperature, Pressure, and Density to 30 km, AFCRL-TR-65-43, AD 612651.
3. Durst, B. A. (1954) Variation of Wind with Time and Distance, Geophysical Memoirs No. 93, British Meteorological Office.
4. Meteorological Group, Range Commanders Council (1977) Meteorological Data Error Estimates, Document 110-77, White Sands Missile Range, NM.
5. COESA (1976) U.S. Standard Atmosphere, 1976, GPO, Washington, D.C.
6. Kantor, A. J., and Cole, A. E. (1977) Monthly 90°N Atmospheres and High-Latitude Warm and Cold Winter Stratosphere/Mesosphere, AFGL-TR-77-0289, AD A051421.

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Appendix A

Interlevel Coefficients of Correlation of Temperature for Altitudes up to 60 km

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Table A1. Ascension Island—Correlation of January Temperatures (°K) From Surface to 60 km

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.079	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	299	287	278	266	253	237	221	237	198	198	208	214	217	222	227	231	233	237	242	248	254	262	266	268	269	271	271	270	268	265	261
STDV	10	14	11	12	12	13	13	13	17	23	22	23	23	28	35	28	30	36	41	50	57	51	41	39	50	56	63	57	59	78	80
N	41	41	41	41	41	41	41	41	41	41	41	41	41	40	40	41	41	41	41	41	41	41	41	41	40	40	40	39	38	32	30
2	34	**																													
4	47	14																													
6	28	-14	55																												
8	25	20	18	30																											
10	29	16	32	44	65																										
12	37	43	22	13	28	44																									
14	45	32	0	4	14	35	60																								
16	8	24	-19	-25	-27	-36	0	28																							
18	-12	-9	7	32	0	-3	-28	-16	-5																						
20	-4	-9	-14	-2	15	-3	-16	3	2	77																					
22	-1	17	-11	-4	30	6	14	5	-2	-4	21																				
24	46	4	31	-1	14	16	20	16	-22	-20	-18	1																			
26	40	-5	48	3	-18	-8	12	-6	-4	-10	-23	-16	44																		
28	27	-11	32	19	-7	4	26	3	11	-18	-5	-1	9	55																	
30	14	1	14	21	-26	5	28	11	4	-1	-30	-26	1	48	67																
32	27	23	12	3	-33	-16	15	6	20	3	-22	0	24	32	22	50															
34	12	-14	29	13	-1	-17	4	-16	14	3	-6	2	27	27	26	8	46														
36	3	-9	20	6	-39	-48	-9	-14	5	-10	-13	-8	7	19	22	17	36	64													
38	-9	-22	7	2	-26	-36	3	-28	-9	2	8	-2	0	27	31	28	22	28	49												
40	-21	-28	21	10	-4	-3	8	-41	-22	4	-1	4	9	19	25	10	-6	21	19	71											
42	-20	-32	30	16	-4	-3	14	-40	-20	-2	-5	-5	-1	34	33	16	-9	26	16	59	81										
44	18	-1	49	14	-15	-10	27	-10	0	-19	-10	-26	15	52	37	25	10	34	28	34	38	65									
46	16	18	46	20	-16	-14	12	-17	-14	-13	-21	-24	10	47	20	31	35	34	40	21	12	26	70								
48	14	12	28	6	2	1	8	-11	-31	-6	-17	-9	21	18	-2	9	10	18	19	18	6	2	27	55							
50	2	7	18	12	8	12	-8	-13	-14	0	-26	-12	13	7	-8	-5	-10	7	1	-2	-3	-10	6	24	76						
52	6	7	9	[illegible]	8	30	5	-2	-9	-2	-42	-22	1	-2	0	13	6	6	-3	-18	-11	-15	-1	7	44	76					
54	26	8	27	20	20	42	18	5	-15	-10	-46	-20	17	21	20	28	5	-6	-16	-19	-16	-10	-3	-7	23	51	73				
56	18	5	31	-5	-1	14	11	-14	-11	-17	-33	-4	27	50	34	38	14	9	16	11	19	15	13	13	21	32	42	69			
58	27	21	45	8	-11	13	20	-14	3	-12	-37	-20	11	65	42	51	28	11	13	13	10	24	34	41	17	24	35	52	81		
60	20	19	48	10	-10	19	14	-15	2	-14	-37	-39	-5	54	25	45	22	8	10	2	-1	20	38	47	18	27	44	54	74	91	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A1. Ascension Island—Correlation of July Temperatures (°K) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.079	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	298	285	277	266	252	236	220	207	201	203	212	216	220	223	227	230	235	239	243	248	254	259	263	267	266	268	267	265	262	256	252
STDV	22	15	14	15	22	22	25	23	15	27	21	20	22	26	34	38	47	56	43	44	48	44	49	51	55	49	51	50	51	68	85
N	45	45	45	45	45	45	45	45	45	45	44	42	38	45	45	45	45	45	45	45	45	45	45	45	45	44	44	44	44	43	37
2	36	**																													
4	30	61																													
6	33	58	71																												
8	39	66	49	57																											
10	40	56	38	49	81																										
12	27	44	45	57	68	82																									
14	4	40	45	45	36	53	66																								
16	-15	12	0	0	-10	-10	-19	11																							
18	-25	-18	-14	-25	-32	-44	-56	-45	19																						
20	9	4	5	20	-10	-21	-30	-31	12	21																					
22	-1	16	28	15	5	-5	-16	-5	29	15	25																				
24	18	28	16	17	-4	2	-12	0	32	32	46	47																			
26	-14	-47	-34	-39	-34	-27	-25	-23	-13	-2	-13	11	-4																		
28	5	-19	-10	-16	0	5	4	8	-15	-14	-43	-8	-19	43																	
30	0	-31	-31	-25	-8	-1	-4	-17	-10	-8	-37	-17	-32	54	64																
32	-17	-20	-25	-21	-19	-15	-23	-17	2	-6	-13	2	-16	51	44	68															
34	-21	-24	-35	32	-27	-13	-16	-20	-6	6	-24	-2	-7	48	42	59	79														
36	-7	-16	-19	-14	-17	-9	-5	-16	-14	-6	-9	6	-13	50	35	49	68	73													
38	-5	-19	-10	-21	-23	-15	-6	-8	-22	-9	-6	-19	-6	41	22	21	48	44	56												
40	-11	-11	-23	-31	-27	-16	-21	-18	-1	7	-13	-14	9	55	31	40	63	57	66	57											
42	2	-27	-38	-33	-19	-17	-22	-32	-15	-2	-13	-21	-15	54	57	63	59	52	51	43	60										
44	3	-21	-20	-14	-10	7	11	13	-9	-17	-20	-16	-22	29	36	32	22	21	22	8	20	57									
46	-6	-13	1	-21	0	5	5	23	-16	-12	-28	15	-20	20	28	33	21	16	7	-8	2	28	62								
48	-7	5	13	3	30	24	29	22	-20	-5	-28	11	-19	3	-2	16	1	3	-12	-26	-17	1	34	72							
50	13	16	12	9	31	29	30	4	-36	-2	-28	8	-3	3	-3	5	-4	11	-7	-6	-7	3	22	39	78						
52	35	17	4	8	26	26	21	6	-33	7	-10	-8	-2	-16	7	1	-19	0	-12	-2	-25	-3	25	24	39	64					
54	31	20	4	3	23	24	23	15	-23	7	-19	-10	-14	-19	3	2	-25	-18	-16	-2	-19	0	32	30	33	47	81				
56	24	32	14	13	30	28	29	25	-11	4	-19	12	10	-8	-2	11	-17	-10	-2	-12	-17	-5	22	46	46	47	54	72			
58	31	25	19	25	42	37	40	23	-21	-4	-27	10	7	6	15	17	-13	0	3	-17	-25	-1	28	39	48	52	45	58	86		
60	28	5	4	18	35	33	42	22	-43	-7	-42	-26	-4	7	23	30	-15	0	-7	-7	-17	21	34	42	51	50	48	47	74	83	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A1. Ascension Island—Correlation of October Temperatures (°K) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.379	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	298	286	278	266	253	238	221	207	199	201	210	215	220	224	229	233	238	242	249	254	260	265	270	273	273	272	269	266	261	257	253
STDV	11	24	10	13	9	13	18	22	11	27	28	21	27	31	35	40	39	32	37	40	40	38	31	32	37	35	34	44	49	55	59
N	47	47	47	47	47	47	47	47	47	47	47	46	46	47	47	48	48	48	48	48	48	48	48	48	48	48	46	48	46	42	36
2	30	**																													
4	22	-9																													
6	11	-39	58																												
8	14	4	24	27																											
10	34	24	28	11	51																										
12	14	12	23	10	34	81																									
14	14	20	10	10	23	41	65																								
16	-1	7	5	-2	20	16	26	27																							
18	-4	-35	0	13	-8	-41	-42	-40	-19																						
20	15	-13	-5	-3	0	-29	-54	-46	-39	43																					
22	-20	-14	0	6	7	-15	-14	-16	-1	36	20																				
24	-6	-10	-12	-6	-7	-22	-38	-44	-13	42	56	19																			
26	1	6	-19	-27	2	21	15	-4	0	-3	-9	-26	7																		
28	6	32	-30	-42	-13	14	4	-2	-11	-26	-5	-39	2	69																	
30	41	28	0	-8	11	39	26	14	2	-41	-9	-32	-13	52	62																
32	29	17	14	5	9	31	4	-17	-4	-22	2	-17	14	50	56	71															
34	6	3	7	-28	-5	15	4	-24	7	7	8	-3	19	56	46	42	55														
36	-1	3	4	-12	5	8	4	-3	-4	3	-2	-23	11	50	38	35	49	53													
38	-9	-11	-9	-12	-11	-8	-9	-22	12	6	6	-14	25	46	27	33	44	47	57												
40	19	-2	-21	-32	-19	9	6	-15	12	4	5	-5	7	61	48	46	44	62	35	61											
42	23	12	-31	-35	-22	2	7	8	5	-14	-10	-11	7	43	49	35	34	27	26	38	53										
44	6	2	-23	-13	2	13	13	-5	8	-17	-35	-5	0	47	37	32	46	26	34	25	32	45									
46	12	-5	2	4	25	12	-6	-13	3	-5	10	-20	17	44	32	33	50	41	56	26	23	17	44								
48	11	10	-18	-14	13	1	-9	-8	18	-9	4	-25	11	48	48	37	42	34	37	22	28	10	32	58							
50	0	26	-27	-12	12	7	-2	8	18	-3	-3	2	21	14	27	6	21	17	34	10	8	11	26	28	60						
52	-13	13	-35	-15	-10	-25	-23	0	15	14	5	21	14	17	16	-15	-14	10	12	-2	6	19	25	14	27	58					
54	-8	16	-35	-28	-10	-10	-15	-3	10	2	10	7	7	37	34	-3	3	19	15	11	25	36	34	32	28	27	72				
56	10	30	-14	-21	1	9	1	25	11	-13	13	-10	4	37	26	11	19	11	22	16	24	32	28	48	29	28	56	83			
58	17	39	-14	-19	9	1	-1	19	5	-6	26	-4	22	36	31	13	22	9	21	11	17	32	33	43	23	32	49	65	85		
60	16	57	-24	-28	-7	-13	-12	8	3	11	32	2	39	22	23	-2	6	5	7	-8	-1	21	13	13	18	47	55	54	63	85	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A2. Kwajalein—Correlation of January Temperatures (°K) From Surface to 60 km

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.008	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	301	288	279	267	255	241	224	208	195	192	206	212	217	221	225	228	232	237	242	247	253	257	262	267	271	272	272	271	268	265	263
STDV	14	13	13	13	14	14	15	16	15	46	28	26	23	30	27	30	36	36	37	42	42	38	42	48	63	64	51	41	44	49	56
N	42	42	42	42	42	42	42	42	42	42	42	42	41	40	41	42	42	42	42	42	42	42	42	42	42	42	42	42	41	38	34
2	-3	**																													
4	15	39																													
6	11	15	48																												
8	-1	-20	23	28																											
10	-2	8	47	43	70																										
12	5	13	44	52	48	85																									
14	5	-4	22	43	60	71	80																								
16	14	10	-13	6	19	8	15	28																							
18	-6	3	-15	-34	-41	-57	-52	-63	1																						
20	-23	-18	-12	0	4	1	-9	-5	-21	10																					
22	-13	-3	-15	-27	-21	-21	-27	-34	-33	33	37																				
24	-14	3	-12	7	-5	-26	-21	-7	-19	16	3	31																			
26	-4	-15	-1	-18	-2	-7	-18	-15	8	11	-28	-11	6																		
28	0	4	5	-9	1	-12	-18	-21	4	17	-9	-3	15	51																	
30	3	-1	9	-26	1	-16	-29	-19	1	25	-6	-6	-8	50	53																
32	16	-3	24	-13	0	-2	-14	-19	-2	24	-1	6	1	28	32	39															
34	20	19	-11	-25	-22	-23	-26	-29	43	29	-27	-20	-30	34	6	29	39														
36	11	31	6	-17	-10	-16	-27	-38	27	38	0	-1	-25	19	19	29	37	47													
38	13	-5	-7	-28	6	3	-10	-19	17	26	25	-6	-39	24	-1	30	26	57	54												
40	-1	-1	-32	-40	-8	-12	-19	-28	19	24	-16	2	-2	23	8	18	21	44	29	47											
42	-22	32	-3	-8	-7	-13	-18	-32	26	24	-4	-3	5	8	34	24	30	33	34	24	51										
44	-1	7	-33	-23	-22	-25	-22	-29	19	29	-3	-2	-11	18	14	25	9	51	15	43	54	64									
46	7	-20	-22	-43	-10	-24	-30	-19	-10	16	-6	-2	8	36	1	41	15	35	-4	32	7	8	37								
48	25	-10	-12	-22	-3	-21	-21	-16	26	23	-25	-26	4	32	32	33	36	58	28	49	33	35	42	53							
50	27	8	8	-7	-7	-9	-12	-22	26	11	-26	-43	-33	20	21	32	32	46	43	48	30	36	39	17	63						
52	9	20	13	4	-6	-6	-11	-22	18	18	5	-31	-32	6	27	33	21	49	45	55	24	35	32	6	53	77					
54	17	12	-9	-4	-8	-7	-26	-34	15	13	2	1	-24	3	14	7	11	39	42	38	31	24	30	1	44	54	64				
56	28	22	25	-9	2	-7	-21	-27	-4	21	-2	12	-8	7	14	31	20	29	32	30	36	25	26	19	35	29	46	59			
58	33	6	32	-16	-4	-12	-20	-31	1	26	-28	-10	-17	26	25	30	13	23	27	19	16	3	1	16	31	39	48	47	65		
60	21	16	10	-2	-7	-7	-14	-24	13	18	-21	-42	-17	19	14	9	2	32	28	23	11	4	5	2	29	50	64	58	32	71	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A2. Kwajalein—Correlation of April Temperatures (°K) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.088	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	302	289	279	267	255	240	224	207	195	195	206	214	220	223	229	233	236	242	248	256	262	267	269	271	272	271	270	267	265	260	255
STDV	14	9	11	13	12	13	14	14	15	27	23	22	19	28	34	32	26	30	36	42	39	36	39	35	36	37	47	44	42	57	69
N	34	34	34	34	34	34	34	34	34	34	34	33	32	35	35	36	36	35	36	36	36	36	36	36	36	36	36	36	35	34	22
2	17	**																													
4	46	48																													
6	24	22	62																												
8	42	12	48	68																											
10	23	13	53	64	67																										
12	27	16	64	56	58	71																									
14	53	22	61	54	54	62	71																								
16	25	4	11	-3	-3	-17	-16	18																							
18	-1	-3	-33	-35	-10	-14	-10	3	-3																						
20	-6	3	8	16	-1	-11	7	-8	19	-26																					
22	35	-8	9	14	38	26	18	33	0	13	-25																				
24	1	-1	19	27	42	30	23	45	-9	-16	-14	19																			
26	-39	-24	-23	-8	-6	-15	0	-19	-25	4	11	-17	6																		
28	-27	-42	-29	5	-5	8	-9	-11	-9	-8	20	-13	-6	48																	
30	-30	-17	-34	-5	-17	-13	-28	-14	5	13	40	-22	-14	35	53																
32	1	-6	-5	-5	12	-11	-13	0	20	4	-2	-17	-8	12	27	52															
34	9	-9	3	10	31	19	30	23	5	4	-1	20	-8	26	17	15	31														
36	1	-5	-5	7	15	11	16	-1	-17	10	14	-34	-22	28	31	21	28	55													
38	-13	13	-10	-10	-8	-5	4	-21	-24	23	-6	-24	-36	27	-6	7	10	44	66												
40	2	9	12	-27	-31	-32	-8	-24	16	5	2	-20	-42	-16	-30	-12	3	12	19	51											
42	-29	-15	6	-1	-3	11	17	-16	14	-14	0	-29	-24	15	10	-1	-2	24	10	12	37										
44	-28	-9	-8	21	12	40	20	4	-11	-1	4	-17	-5	-9	34	30	26	27	36	17	-11	37									
46	-18	10	4	9	8	16	6	-5	19	2	8	-27	-17	-4	6	13	25	31	36	33	9	23	49								
48	4	-2	-1	10	19	3	8	5	1	2	10	-18	-17	-1	1	20	44	42	59	46	20	15	28	53							
50	-27	-35	-58	-34	-29	-42	-32	-43	-17	10	13	-15	-27	20	12	23	24	30	35	48	19	7	22	6	43						
52	-18	-24	-23	-8	-21	-16	3	-15	-18	4	27	-33	-25	31	25	26	15	39	48	53	36	31	32	2	25	73					
54	-26	-24	-28	-11	-24	-16	-10	-14	-2	5	27	-52	-25	38	49	49	29	38	64	56	24	26	44	30	41	52	76				
56	-34	-12	-21	-13	-31	1	-2	-3	-15	10	6	-4	-27	28	37	48	26	47	32	38	30	26	53	30	21	37	52	62			
58	-19	-13	-8	-10	-16	9	8	3	-12	21	3	-13	-32	22	31	41	28	43	40	42	43	36	48	41	34	27	45	58	88		
60	-23	-19	-19	-25	-20	3	4	-2	-10	26	-8	-23	-46	34	28	43	35	30	45	47	46	51	42	28	46	39	56	65	77	90	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A2. Kwajalein—Correlation of July Temperatures (°K) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.008	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	301	286	278	266	254	239	222	206	198	203	210	215	219	222	227	230	233	237	241	248	254	259	262	265	266	263	266	265	261	257	253
STDV	12	8	10	12	14	17	16	17	17	24	17	15	20	20	21	34	31	43	42	55	34	35	37	30	48	49	56	69	65	69	61
N	31	31	31	31	31	31	31	31	31	31	31	30	29	25	30	31	32	32	32	32	32	32	32	32	32	32	32	31	31	30	27
2	33	**																													
4	38	72																													
6	23	66	78																												
8	2	49	44	52																											
10	-4	57	50	52	77																										
12	4	64	52	54	72	94																									
14	22	66	48	57	38	52	66																								
16	26	6	11	0	-39	-30	-20	9																							
18	-7	-11	-26	0	-7	-10	-5	7	-22																						
20	-14	-1	12	22	-7	-11	-15	-20	-15	-37																					
22	32	-4	-6	12	-34	-29	-12	20	40	9	15																				
24	28	18	43	42	0	-6	-3	20	18	2	25	14																			
26	-2	-3	-1	17	26	4	8	31	7	36	-40	10	9																		
28	-7	35	12	25	33	23	24	45	9	6	-38	-20	-19	45																	
30	12	30	19	31	15	8	26	44	7	-6	-15	13	-6	34	47																
32	28	46	32	42	10	24	27	52	5	17	-24	19	22	46	39	52															
34	24	46	43	44	20	27	32	43	5	2	-1	23	5	49	28	42	74														
36	6	32	24	40	23	32	34	39	18	-14	14	29	-10	33	13	38	50	72													
38	-2	23	29	34	31	20	23	25	7	4	-7	10	5	36	29	28	44	55	53												
40	24	16	18	37	29	19	20	44	11	-6	-10	24	34	37	38	36	46	39	38	52											
42	29	14	17	30	16	2	14	39	26	32	-29	33	49	37	10	19	39	24	25	42	49										
44	1	27	24	31	20	31	40	33	2	17	-23	2	23	25	6	26	42	27	27	37	9	49									
46	0	16	23	27	9	15	23	23	1	-5	-8	7	9	20	13	35	30	27	27	44	18	29	76								
48	5	5	9	21	4	-4	1	18	22	0	-23	39	-18	53	20	39	32	43	54	44	36	26	36	61							
50	-1	-4	-8	17	13	3	5	12	12	24	-29	25	-21	60	29	21	19	23	32	21	15	24	33	46	79						
52	11	-22	-1	7	10	7	6	6	-1	25	-29	0	-1	36	0	6	4	14	9	16	12	18	31	48	48	64					
54	21	-5	5	7	12	16	21	31	-11	33	-38	1	8	24	1	25	21	25	25	16	26	27	42	43	43	42	76				
56	17	1	2	11	17	22	24	35	-19	33	-51	0	-2	36	25	27	27	18	15	18	41	30	47	42	53	55	59	77			
58	25	20	23	44	9	12	11	37	2	18	-34	20	14	28	56	38	40	28	28	28	46	35	40	53	65	62	47	55	76		
60	34	26	21	43	4	23	21	48	9	18	-122	21	20	24	44	34	36	24	37	22	38	36	43	46	43	50	46	59	72	89	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

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Table A2. Kwajalein—Correlation of October Temperatures (°K) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.008	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	302	289	278	267	254	240	223	207	197	199	207	213	219	225	229	234	237	242	248	256	260	265	268	269	271	273	271	269	265	261	257
STDV	12	6	9	9	11	14	13	12	19	25	27	25	18	27	27	30	36	33	41	41	35	40	41	45	47	44	43	42	39	49	61
N	40	40	40	40	40	40	40	40	40	40	40	40	38	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	40	39	34
2	41	**																													
4	51	57																													
6	33	19	70																												
8	3	8	39	51																											
10	5	5	37	53	61																										
12	4	16	37	51	65	84																									
14	17	23	28	24	40	14	43																								
16	11	13	-11	-17	-9	-21	-1	17																							
18	27	17	1	-12	-19	-21	-22	-12	21																						
20	24	-7	1	-11	-20	-39	-22	6	20	36																					
22	37	11	15	24	-7	0	5	16	-10	71	21																				
24	48	32	17	7	-8	4	15	21	-14	4	2	32																			
26	27	31	20	22	19	23	30	41	15	3	-19	18	39																		
28	5	25	5	13	5	30	28	22	2	4	-38	-4	20	49																	
30	5	33	2	13	14	15	21	15	-15	5	-24	-10	25	43	53																
32	17	28	-7	2	6	4	9	14	23	25	-14	-8	26	52	56	62															
34	13	22	-5	-10	-2	-9	3	23	25	7	3	-4	14	52	36	54	71														
36	29	12	13	16	1	2	-4	1	20	20	-11	15	8	44	48	34	45	38													
38	42	17	12	19	0	10	13	19	34	8	-5	10	19	66	41	26	48	33	53												
40	17	19	-7	-13	-17	5	4	3	4	32	-4	22	23	29	32	38	37	30	28	36											
42	-2	-8	-11	-15	-4	-5	-11	1	-3	13	-8	-1	1	6	5	17	27	23	35	17	60										
44	-10	-4	-9	2	34	11	19	32	13	21	-3	0	3	47	15	20	40	31	32	29	18	27									
46	11	4	0	10	16	19	24	17	-3	22	8	19	29	45	12	24	45	41	41	37	27	43	69								
48	28	37	23	14	13	18	17	11	6	19	-8	8	44	50	29	31	61	46	42	42	39	27	44	65							
50	35	35	25	31	8	21	16	17	5	21	-20	14	31	48	59	49	71	51	58	52	43	28	36	52	63						
52	23	26	20	34	19	20	26	18	24	19	-37	-5	29	47	51	42	51	40	33	46	39	12	22	25	45	64					
54	27	28	15	26	-3	6	10	12	28	23	-23	10	37	33	30	39	43	39	23	29	38	13	15	22	45	54	82				
56	26	16	19	24	0	22	5	3	8	24	-24	7	15	33	50	36	39	32	42	32	44	20	2	20	42	60	69	73			
58	30	15	9	11	3	15	2	3	16	28	-12	8	21	42	34	29	46	46	38	40	46	35	23	43	45	52	65	63	81		
60	43	15	6	7	-5	10	1	14	11	29	3	17	30	51	39	36	51	57	42	51	55	40	31	52	54	57	58	55	71	91	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A3. Wallops Island—Correlation of January Temperatures (°K) From Surface to 60 km

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.015	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	275	269	260	248	235	222	216	215	211	210	211	214	216	220	223	226	231	236	242	249	255	262	268	270	269	266	263	260	258	256	252
STDV	54	86	79	69	53	33	55	39	44	45	35	35	38	45	54	59	60	63	61	79	95	89	82	80	63	47	66	74	77	90	106
N	44	44	44	44	44	44	44	44	43	43	43	43	43	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	40	34	19
2	74	**																													
4	66	96																													
6	61	87	96																												
8	52	79	88	94																											
10	5	10	14	17	42																										
12	-44	-46	-56	-62	-55	13																									
14	-47	-65	-73	-76	-74	-13	74																								
16	-54	-72	-78	-79	-79	-10	63	89																							
18	-49	-79	-82	-83	-81	-20	42	72	82																						
20	-41	-60	-59	-56	-57	-14	28	51	58	72																					
22	-27	-42	-41	-42	-48	-17	19	28	37	60	81																				
24	-13	-32	-28	-27	-31	-8	-1	2	12	34	52	64																			
26	7	-19	-19	-14	-18	-7	-2	-5	-9	10	37	48	73																		
28	0	-19	-17	-15	-15	6	0	-3	-12	9	37	42	60	86																	
30	11	-25	-22	-17	-17	0	-5	-4	-12	14	35	38	52	79	83																
32	15	-19	-18	-15	-19	-11	-3	1	-7	11	21	13	31	60	63	82															
34	13	-14	-19	-20	-23	-18	11	6	-6	6	3	-9	8	30	29	55	80														
36	3	-15	-23	-29	-33	-30	15	8	7	11	-3	-13	-2	16	15	31	58	91													
38	-4	2	-5	-11	-7	-9	4	-10	-4	-3	-25	-36	-24	-22	-26	-26	-2	30	60												
40	-10	1	-5	-9	-2	0	5	-13	-9	-10	-29	-42	-29	-28	-32	-31	-14	19	46	89											
42	-12	5	5	9	14	8	-3	-28	-20	-27	-43	-44	-23	-29	-29	-30	-17	6	29	68	79										
44	-16	3	5	10	12	8	3	-28	-17	-26	-35	-37	-29	-21	-21	-22	-6	3	26	54	63	85									
46	-23	-1	3	7	9	10	-2	-21	-12	-21	-30	-36	-28	-22	-21	-29	-12	-2	19	52	63	74	87								
48	-17	1	5	18	10	7	-14	-18	-14	-23	-33	-43	-34	-21	-14	-22	2	2	19	42	49	62	69	85							
50	-14	-7	-5	1	1	4	-3	-2	4	-10	-30	-38	-32	-21	-21	-15	16	20	33	45	40	42	49	61	76						
52	15	10	9	13	16	3	-7	-6	-5	-14	-37	-47	-40	-23	-16	-11	10	25	41	47	33	32	26	33	40	66					
54	20	11	18	11	15	6	-7	-4	2	-9	-23	-34	-34	-10	-3	0	15	17	32	25	8	10	16	12	18	36	80				
56	23	8	5	8	11	6	-12	-7	2	-5	-7	-15	-26	-1	0	1	14	11	23	12	0	3	8	10	21	29	58	82			
58	23	23	22	24	28	21	-8	-14	-9	-17	-19	-20	-37	-15	-13	-14	1	-5	7	2	-2	1	9	22	29	33	51	71	89		
60	27	19	22	21	29	51	-3	-23	-19	-29	-18	-9	-35	1	-4	-4	14	-5	18	13	7	3	20	32	35	43	38	59	77	95	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A3. Wallops Island—Correlation of April Temperatures (°K) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.013	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	285	276	265	252	238	224	215	215	213	212	214	216	219	222	226	231	236	242	247	253	259	264	269	271	272	272	270	268	265	261	257
STDV	61	57	48	49	48	40	55	45	35	39	29	26	30	34	37	41	43	45	50	44	52	51	49	49	43	44	40	47	47	63	66
N	48	48	48	48	48	48	48	48	48	48	48	47	45	48	48	48	48	48	48	48	48	48	47	48	48	48	46	48	43	37	30
2	65	**																													
4	57	91																													
6	51	82	97																												
8	48	70	83	86																											
10	30	34	36	37	60																										
12	-24	-62	-62	-59	-35	26																									
14	-47	-66	-80	-83	-70	-29	62																								
16	-56	-72	-77	-76	-79	-57	30	69																							
18	-48	-60	-62	-63	-72	-61	18	36	72																						
20	-49	-55	-50	-44	-59	-70	4	22	65	83																					
22	-23	-25	-15	-9	-23	-50	-7	-9	31	69	80																				
24	-12	-14	0	9	-5	-41	-16	-17	14	41	56	76																			
26	8	22	25	30	21	-10	-25	-28	-14	14	27	56	53																		
28	0	25	28	32	29	-5	-25	-28	-20	0	13	34	37	85																	
30	-7	19	23	28	23	-9	-19	-23	-17	0	13	31	30	66	81																
32	8	28	26	28	23	0	-26	-19	-22	-18	-9	3	3	54	70	79															
34	-2	25	17	16	11	-4	-16	-2	-17	-17	-16	-7	-17	27	41	62	76														
36	2	11	2	0	1	-2	-5	17	1	-14	-9	-11	-20	24	29	47	63	79													
38	9	16	7	2	-5	-5	-17	4	5	-7	-4	-2	-10	17	13	18	38	48	74												
40	20	27	12	4	-3	-4	-21	-5	-2	-10	-9	-13	-21	12	9	-7	14	22	43	75											
42	13	27	27	19	11	-4	-30	-24	-7	-9	-9	-3	0	9	3	-9	4	-1	15	52	70										
44	9	21	18	12	12	0	-24	-30	-9	6	2	5	4	16	14	1	6	2	1	38	54	76									
46	0	8	10	7	-3	-28	-21	-12	12	19	22	31	31	21	7	-6	-15	-12	-1	30	44	59	70								
48	4	19	18	2	-8	-23	-28	-5	14	14	11	17	11	15	1	-19	-8	-6	9	48	64	65	61	79							
50	-7	12	2	-7	-4	-8	-9	6	18	7	0	-9	-12	2	6	-10	-6	-11	14	42	60	55	56	65	74						
52	12	25	23	18	19	3	-20	-17	-7	-11	-9	-9	-2	5	3	-3	-5	-4	28	35	46	60	66	70	63	69					
54	13	37	34	27	16	3	-26	-17	-19	-17	-20	-9	-2	15	9	15	14	24	32	49	47	61	62	61	51	51	79				
56	-6	22	25	21	19	-5	-18	-18	-15	-1	9	21	12	41	29	22	17	20	27	41	44	61	62	58	55	42	64	42			
58	8	30	21	13	16	13	-12	-13	-21	-6	-7	-1	-13	21	13	7	10	26	30	43	61	64	66	42	48	39	56	74	81		
60	8	25	18	14	20	20	-9	-17	-13	17	2	27	8	50	38	23	9	9	24	29	37	37	51	42	41	40	67	70	75	85	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A3. Wallops Island—Correlation of July Temperatures (°K) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.015	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	297	286	275	264	251	236	220	210	209	212	216	220	223	226	229	233	237	241	246	251	256	262	267	270	271	270	267	264	260	256	251
STDV	34	21	16	14	20	22	22	27	29	23	16	17	16	24	25	30	28	30	27	27	32	37	43	42	36	38	40	47	55	62	88
N	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	34	33	16
2	75	**																													
4	47	68																													
6	36	53	84																												
8	38	48	69	67																											
10	25	37	48	51	81																										
12	12	29	27	27	48	80																									
14	-8	-18	-26	-11	-28	-7	18																								
16	-22	-48	-39	-46	-55	-50	-25	36																							
18	-10	-25	-14	-24	-35	-47	-32	31	67																						
20	0	-5	-11	-20	-11	-33	-32	17	48	57																					
22	-13	-11	-8	-5	-4	-15	-9	7	42	50	68																				
24	-22	-12	-3	-4	3	12	25	13	22	11	41	48																			
26	-10	-13	17	22	24	31	25	6	10	1	7	32	48																		
28	1	-1	21	19	33	41	27	-3	13	-7	14	35	46	70																	
30	-8	-8	17	8	18	32	25	-5	8	-18	-2	10	33	49	76																
32	-18	-6	23	10	11	17	20	-11	16	2	10	22	54	44	61	72															
34	-22	-19	15	11	28	37	27	-11	9	-15	7	14	45	64	62	60	63														
36	-32	-23	4	-3	13	25	29	4	31	14	27	50	65	62	67	54	61	68													
38	11	-14	17	25	29	28	6	-1	10	9	-2	12	34	61	62	56	47	49	44												
40	-20	-16	17	17	14	18	8	-32	-11	-20	-26	-6	17	27	23	40	47	50	30	49											
42	-33	-28	1	-1	-5	1	15	-10	22	0	-8	16	16	6	21	48	49	42	32	19	70										
44	-6	11	35	37	30	39	41	6	-2	-14	-8	11	29	40	55	52	58	48	38	38	47	53									
46	-18	0	41	41	31	27	20	12	5	-2	-4	13	25	50	54	45	48	51	41	35	30	35	82								
48	-26	-13	18	31	21	25	13	13	-1	-13	-2	16	38	38	53	48	56	42	34	40	34	34	60	66							
50	-25	-15	8	13	23	32	21	-7	-5	-10	2	22	43	51	56	55	55	52	39	42	42	34	48	51	81						
52	-31	-32	-12	-16	9	10	14	-5	9	6	29	40	51	45	49	42	47	52	43	26	27	40	31	30	43	66					
54	-37	-32	-18	-16	9	8	14	-17	6	3	27	44	57	52	45	39	53	57	50	24	32	41	26	23	28	54	88				
56	-23	-16	-7	-18	15	10	15	-23	-1	5	42	39	64	37	30	19	46	47	45	22	26	20	18	3	13	32	66	86			
58	-20	-15	5	6	36	26	17	-17	-9	1	41	44	44	46	41	10	38	56	50	22	29	17	29	19	28	36	61	77	87		
60	-20	-7	8	1	58	48	35	-42	-22	-13	41	56	63	65	72	50	54	79	77	30	37	31	40	25	36	63	86	90	96	95	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A3. Wallops Island—Correlation of October Temperatures (°K) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.015	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	289	280	270	259	244	229	217	210	208	210	214	216	220	224	226	229	232	235	238	244	250	255	261	266	268	268	268	267	265	264	262
STDV	62	41	35	34	39	38	38	32	36	28	24	25	25	33	35	40	44	49	59	63	56	52	60	54	54	62	59	60	63	82	96
N	44	44	44	44	44	44	44	44	44	42	42	42	41	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	40	36	27
2	71	**																													
4	62	89																													
6	58	79	90																												
8	57	80	88	92																											
10	55	71	79	84	94																										
12	9	6	16	16	70	46																									
14	-26	-47	-57	-62	-60	-48	28																								
16	-31	-54	-65	-68	-68	-64	-11	59																							
18	-43	-60	-71	-68	-69	-71	-38	31	72																						
20	-39	-48	-54	-51	-46	-47	-35	16	54	81																					
22	-41	-43	-47	-49	-43	-43	-21	9	54	76	83																				
24	-27	-25	-27	-35	-27	-28	-22	-7	42	56	54	83																			
26	-7	-15	-17	-19	-12	-7	-14	-8	27	27	33	43	66																		
28	-12	-17	-21	-22	-14	-11	-13	-16	28	30	27	37	54	86																	
30	-3	-7	-11	-10	0	2	-12	-17	10	11	17	20	44	75	90																
32	-8	-22	-26	-23	-9	2	4	-4	13	15	19	24	45	77	75	86															
34	-2	-3	-13	-7	6	15	-2	-25	-2	-1	14	21	33	57	65	65	78														
36	-4	7	-1	5	13	17	9	-22	-9	-9	-2	3	19	45	60	62	65	80													
38	5	-1	-7	-6	2	6	8	-14	-5	5	16	14	22	50	60	59	68	75	84												
40	2	-9	-11	-9	-1	5	9	-11	-7	5	18	14	21	38	52	47	57	66	74	86											
42	-4	-6	-13	-11	-3	4	4	-18	-13	13	25	20	20	37	48	50	55	59	67	78	79										
44	-14	-8	-10	-10	0	7	16	-11	-8	11	18	15	13	38	49	47	50	50	62	76	71	85									
46	-2	4	-2	-2	7	14	14	-15	-15	-4	6	0	3	36	47	43	51	55	69	79	71	76	86								
48	-5	-3	-4	-8	4	11	15	-13	-12	-5	3	-1	5	31	37	33	44	40	57	62	65	64	72	86							
50	-8	-5	-7	-13	-2	3	15	-1	-5	-3	-2	0	12	41	46	42	47	35	53	56	61	54	59	75	90						
52	-12	-9	-14	-18	-10	-8	3	-1	1	3	-3	-3	4	39	48	38	42	32	47	52	50	54	66	74	80	86					
54	-10	-4	-11	-21	-11	-8	-1	-1	5	14	5	2	8	33	44	34	38	27	42	43	43	52	61	67	76	77	88				
56	-9	-6	-10	-17	-15	-13	-7	1	2	15	10	0	4	29	40	27	30	19	47	47	48	60	64	66	73	68	81	91			
58	-7	-8	-8	-11	-12	-9	5	2	-1	9	2	-5	1	27	41	27	29	18	50	49	46	57	61	71	68	64	77	83	94		
60	7	4	1	5	-8	-4	3	2	-9	-3	-4	-16	-11	26	40	27	25	22	51	49	51	50	58	69	60	56	65	71	80	91	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A4. Churchill—Correlation of January Temperatures (°K) From Surface to 60 km

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.035	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	244	250	240	228	219	219	219	218	218	217	219	218	219	217	218	219	223	225	230	233	238	243	248	252	255	258	258	259	257	257	258
STDV	75	58	49	43	45	52	61	70	75	78	63	69	70	98	96	88	85	89	109	125	166	171	187	173	160	148	143	147	146	138	127
N	50	50	50	50	50	50	50	50	46	40	30	29	23	45	48	50	51	51	51	51	51	51	51	51	51	51	51	51	49	46	36
2	72	**																													
4	53	84																													
6	55	75	82																												
8	46	23	17	47																											
10	30	3	-4	13	85																										
12	32	16	9	19	73	94																									
14	34	21	12	23	68	89	98																								
16	25	18	10	17	56	81	94	98																							
18	26	23	13	10	45	71	85	90	95																						
20	22	14	8	1	38	61	73	78	83	54																					
22	24	14	17	4	30	51	59	59	65	80	93																				
24	22	16	2	-5	9	28	33	28	40	62	84	98																			
26	6	-1	0	-1	17	44	55	58	66	76	80	94	96																		
28	0	0	7	1	9	33	45	48	62	74	73	92	94	96																	
30	-1	4	14	10	4	19	29	33	53	66	72	86	83	87	95																
32	-11	-3	11	-1	-22	-17	-13	-13	7	19	39	59	71	56	73	84															
34	-1	10	21	8	-23	-29	-29	-29	-15	-5	18	37	50	32	50	64	88														
36	-6	1	16	4	-24	-35	-37	-37	-31	-19	18	30	34	12	29	44	74	85													
38	5	1	8	-2	-18	-8	-34	-35	-30	-17	9	15	21	-1	13	27	60	78	92												
40	17	6	6	-2	-14	-27	-34	-37	-37	-29	-3	0	6	-19	-10	1	37	61	78	92											
42	9	1	4	-2	-15	-32	-42	-46	-50	-46	-16	-16	-10	-39	-29	-16	26	51	70	84	93										
44	7	-1	-1	-8	-22	-39	-49	-52	-59	-55	-33	-35	-23	-53	-46	-36	3	34	55	72	82	92									
46	0	-6	-6	-15	-30	-44	-53	-56	-63	-59	-36	-39	-32	-52	-47	-41	-3	25	46	60	74	83	93								
48	-1	-11	-10	-21	-33	-47	-58	-61	-65	-62	-42	-41	-35	-52	-46	-41	-3	24	43	55	67	78	89	96							
50	-1	-11	-17	-29	-33	-44	-52	-53	-57	-52	-36	-36	-35	-45	-42	-40	-14	11	27	39	52	59	73	81	87						
52	-3	-13	-21	-31	-29	-37	-44	-44	-48	-50	-32	-34	-35	-43	-43	-46	-22	-1	13	22	36	44	59	68	76	92					
54	-5	-12	-20	-30	-25	-31	-37	-37	-43	-51	-41	-46	-46	-47	-49	-54	-34	-13	1	8	22	32	47	56	63	79	93				
56	-5	-14	-22	-32	-23	-23	-26	-25	-33	-41	-41	-45	-44	-34	-38	-49	-41	-24	-14	-7	4	13	28	36	47	67	81	92			
58	-4	-14	-20	-28	-16	-15	-17	-15	-21	-36	-43	-46	-49	-28	-33	-45	-45	-34	-31	-27	-20	-9	10	18	34	59	74	85	95		
60	-20	-23	-24	-36	-18	-14	-19	-17	-24	-31	-49	-51	-50	-38	-38	-49	-44	-40	-32	-27	-22	-5	12	22	32	50	61	75	81	87	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A4. Churchill—Correlation of April Temperatures (°K) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.035	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	262	262	252	239	226	222	223	224	223	222	222	221	221	221	222	225	229	234	240	246	253	260	266	270	272	273	272	271	269	267	267
STDV	76	50	51	49	35	25	38	25	26	28	25	28	30	32	33	43	56	63	70	74	76	75	71	65	63	63	61	66	71	73	72
N	42	42	42	42	42	42	42	42	42	42	42	40	36	38	39	40	41	41	41	42	42	42	42	42	39	39	39	40	38	38	31
2	74	**																													
4	61	90																													
6	51	86	97																												
8	53	67	73	75																											
10	8	-18	-30	-36	22																										
12	-14	-38	-54	-60	-43	66																									
14	-28	-45	-59	-61	-47	47	82																								
16	-45	-57	-66	-65	-54	19	41	72																							
18	-44	-52	-47	-45	-34	7	18	48	83																						
20	-36	-39	-44	-47	-32	21	33	60	80	87																					
22	-18	-20	-26	-31	-19	24	32	55	73	80	93																				
24	-9	-16	-22	-27	-19	26	33	50	72	69	81	94																			
26	9	17	7	1	-4	6	12	18	35	37	55	68	77																		
28	35	31	12	7	8	8	7	7	21	23	34	48	62	82																	
30	50	49	40	33	23	-8	-14	-28	-19	-10	-6	10	31	63	79																
32	51	55	45	42	35	-11	-25	-45	-37	-24	-26	-12	6	40	60	89															
34	55	54	47	46	45	-14	-40	-57	-49	-37	-39	-30	-17	20	44	76	88														
36	49	46	38	39	41	-9	-34	-54	-50	-35	-36	-27	-22	12	31	63	81	93													
38	42	46	42	46	44	-13	-36	-55	-49	-32	-33	-28	-23	12	26	54	74	85	92												
40	45	41	36	39	41	-6	-28	-41	-38	-27	-30	-25	-31	6	19	39	58	74	83	91											
42	36	33	28	31	30	-10	-26	-36	-31	-26	-26	-23	-31	10	20	36	51	67	77	82	93										
44	35	30	26	30	27	-12	-24	-40	-37	-27	-32	-29	-33	4	21	33	54	67	78	84	92	93									
46	35	30	27	37	37	2	-20	-34	-35	-24	-30	-26	-27	7	24	35	53	66	77	84	89	88	91								
48	30	24	19	26	31	5	-11	-21	-24	-16	-18	-14	-22	15	20	35	53	59	71	78	89	90	87	90							
50	32	24	16	21	26	10	-1	-19	-26	-21	-22	-14	-17	16	25	37	53	54	65	69	79	82	85	85	91						
52	36	25	17	20	31	21	4	-18	-31	-29	-23	-15	-17	21	28	37	49	54	62	62	73	75	74	75	83	91					
54	30	12	4	8	14	11	5	-14	-22	-27	-27	-25	-19	7	17	21	35	42	51	53	65	66	72	69	76	86	89				
56	31	10	-2	-1	19	32	14	-5	-17	-23	-10	-12	-15	8	16	19	33	36	49	44	56	58	62	59	71	82	85	91			
58	17	0	-9	-6	8	29	18	-5	-21	-32	-25	-17	-20	5	7	6	19	27	40	38	49	57	57	57	67	78	81	84	93		
60	17	5	15	17	24	14	-4	-34	-41	-47	-49	-47	-43	-18	-8	-1	13	24	31	35	47	49	57	53	56	73	76	83	88	95	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A4. Churchill—Correlation of July Temperatures(°K)From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.035	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	6C
MEAN	284	277	265	252	238	228	224	225	225	225	226	227	229	231	235	238	242	247	251	257	262	268	274	278	279	280	278	276	274	271	269
STDV	53	37	40	47	49	25	49	22	23	22	20	18	16	24	21	25	24	32	30	30	35	37	34	31	39	41	43	45	39	38	43
N	28	28	28	28	28	28	28	28	28	28	28	27	27	28	28	28	28	28	28	28	28	28	28	28	28	23	26	25	25	21	20
2	49	**																													
4	53	89																													
6	49	87	95																												
8	44	82	90	96																											
10	19	35	42	42	55																										
12	-24	-66	-69	-76	-73	-3																									
14	-22	-69	-73	-74	-74	-12	83																								
16	-36	-82	-84	-84	-82	-32	69	78																							
18	-22	-75	-71	-69	-66	-33	46	63	90																						
20	-15	-66	-56	-52	-50	-28	27	45	72	91																					
22	-13	-71	-65	-61	-59	-36	43	54	81	93	97																				
24	-13	-65	-61	-53	-54	-37	37	52	76	80	81	85																			
26	1	-37	-39	-37	-39	-18	27	42	54	53	48	55	62																		
28	1	-32	-36	-37	-33	-6	29	44	50	48	38	44	49	92																	
30	19	-23	-16	-15	-19	-14	19	27	34	25	14	25	37	82	77																
32	26	-9	-17	-11	-12	-12	15	33	28	27	16	27	31	78	76	62															
34	41	-4	-10	-11	-12	-6	22	27	26	24	9	21	17	64	67	78	84														
36	22	-20	-21	-23	-24	-6	32	32	28	17	4	14	27	56	54	71	62	72													
38	19	-23	-28	-33	-33	-13	17	29	32	25	17	23	23	68	73	66	63	64	66												
40	30	-8	-18	-21	-19	-8	5	12	34	41	34	35	32	68	70	58	56	63	49	69											
42	39	15	7	1	2	10	6	5	17	17	7	11	6	52	63	57	60	64	38	54	77										
44	23	11	-1	-6	-1	7	18	9	17	11	-6	-4	0	45	54	46	51	59	47	44	62	80									
46	15	-10	-8	-18	-16	-7	9	-1	16	15	4	6	2	47	50	41	38	51	55	61	51	42	61								
48	29	15	13	12	12	10	0	-10	0	1	-9	-7	0	37	40	38	48	55	51	41	45	38	52	71							
50	40	25	23	26	20	14	4	4	-6	-10	-22	-18	0	37	34	49	63	60	57	38	33	38	53	45	90						
52	20	9	3	5	-1	9	22	26	15	-5	-27	-19	-3	42	42	59	70	58	54	40	25	47	56	40	64	90					
54	2	-8	-11	-9	-12	9	27	37	31	12	-9	-1	10	46	51	55	67	54	52	47	26	50	53	49	65	78	93				
56	12	-7	-12	-7	-9	4	24	34	29	11	-13	-3	8	43	51	57	69	64	57	54	34	54	63	52	68	81	91	95			
58	6	-25	-16	-6	-8	6	11	39	44	35	22	24	38	57	59	61	72	67	43	52	43	46	49	37	55	71	80	67	93		
60	9	-9	4	6	7	19	2	14	29	19	5	7	26	50	58	54	55	58	36	48	41	47	56	46	60	66	69	77	81	90	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A4. Churchill—Correlation of October Temperatures (°K) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.035	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	270	264	255	242	229	222	221	221	219	218	217	216	216	217	218	219	221	224	227	232	237	242	247	253	255	258	260	261	262	261	261
STDV	56	58	60	63	46	25	41	30	29	28	27	26	32	41	49	58	62	72	68	75	79	82	85	82	71	64	62	72	71	88	98
N	51	51	51	51	51	51	51	51	51	51	47	40	34	49	49	49	49	50	51	51	51	51	51	51	51	51	51	49	46	44	36
2	51	**																													
4	44	93																													
6	40	87	96																												
8	42	80	88	91																											
10	28	6	9	8	76																										
12	0	-46	-53	-53	-43	53																									
14	9	-33	-42	-45	-36	47	93																								
16	13	-35	-41	-45	-40	27	78	88																							
18	25	-15	-16	-15	-11	24	57	68	84																						
20	22	-9	0	3	6	29	47	56	71	91																					
22	13	-10	4	7	10	30	38	42	54	78	92																				
24	15	-4	11	14	18	26	29	27	44	72	77	92																			
26	7	14	30	28	27	11	5	5	12	29	53	75	83																		
28	14	25	34	32	39	26	1	1	2	22	40	65	79	84																	
30	2	13	21	16	23	20	7	5	2	15	30	58	74	83	93																
32	8	13	22	19	24	19	3	-3	-7	6	22	54	68	79	86	93															
34	5	11	18	15	23	19	2	-3	-6	5	17	47	63	71	84	90	95														
36	3	13	19	18	25	15	-5	-9	-13	-1	10	37	52	64	79	86	92	97													
38	11	12	15	16	22	17	4	1	-3	9	18	49	55	61	75	80	88	92	93												
40	16	6	8	7	12	17	9	7	0	8	15	43	50	56	67	74	84	87	89	94											
42	15	5	9	9	14	11	2	3	-4	3	11	41	46	51	62	68	78	84	86	90	95										
44	13	-1	4	5	12	10	-3	-4	-8	-4	1	30	36	41	48	58	70	77	79	84	88	93									
46	16	2	5	6	12	9	-1	1	-2	4	11	29	31	40	43	51	61	69	70	76	79	85	98								
48	4	-4	0	0	6	3	1	1	0	6	16	33	31	42	43	54	62	67	70	74	74	79	83	94							
50	5	10	11	11	18	7	-1	2	2	4	7	9	11	24	25	34	40	50	52	56	52	61	70	61	85						
52	-9	-2	4	6	11	-1	-9	-9	-10	-8	-6	-2	2	17	17	25	27	40	41	45	42	51	61	67	70	87					
54	-25	-11	-3	-3	1	2	-15	-18	-22	-31	-29	-14	-21	3	4	7	9	22	22	27	26	36	40	43	39	51	71				
56	-37	-14	-3	-4	-6	-11	-22	-28	-32	-41	-38	-23	-23	-1	-12	-5	-1	9	9	7	18	17	22	28	28	36	55	83			
58	-41	-17	-5	-6	-11	-23	-29	-35	-43	-50	-52	-35	-36	-12	-27	-19	-15	-7	-5	-9	-6	2	18	16	20	28	48	70	89		
60	-28	-7	2	2	-6	-26	-32	-40	-51	-53	-55	-36	-41	-19	-28	-24	-22	-12	-10	-15	-13	-4	6	5	6	20	39	56	76	91	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A5. Ft. Sherman—Correlation of January Temperatures (°K) From 26 km to 60 km

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	224	226	229	234	238	244	250	256	261	264	267	270	274	276	274	271	267	265
STDV	47	43	47	50	63	54	58	49	50	50	49	52	51	50	48	59	89	72
N	29	30	31	31	31	31	31	31	31	31	31	31	31	30	30	26	19	14
28	71	**																
30	53	64																
32	50	55	79															
34	27	34	71	76														
36	37	36	77	78	74													
38	37	27	74	64	53	76												
40	0	21	47	21	44	49	57											
42	21	28	67	48	55	65	61	64										
44	18	4	43	37	49	42	50	29	63									
46	1	-12	38	47	51	64	57	32	54	63								
48	3	5	44	49	57	53	46	36	47	50	65							
50	32	39	38	17	36	3	13	17	17	27	7	26						
52	48	46	24	32	23	7	20	8	2	17	-8	9	52					
54	58	42	14	38	11	15	20	-15	-9	-12	-13	-14	11	67				
56	64	47	25	33	8	8	11	-19	-7	-11	-31	-28	22	57	83			
58	81	78	59	57	29	24	57	14	30	19	-14	-14	48	64	84	68		
60	64	76	54	46	9	33	68	17	34	6	-31	-67	1	40	75	85	89	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A5. Ft. Sherman—Correlation of April Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMEER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	223	227	232	236	242	248	253	259	265	270	272	272	272	270	268	266	261	257
STDV	37	37	39	32	37	46	45	45	39	34	38	38	37	38	36	43	46	48
N	31	31	31	31	31	31	31	31	31	31	31	31	31	31	31	27	21	18
28	64	**																
30	71	66																
32	59	64	77															
34	62	54	64	74														
36	33	34	29	37	61													
38	36	30	45	46	56	73												
40	29	9	27	36	40	29	50											
42	34	14	6	9	10	G	-8	15										
44	31	24	35	32	13	-6	-19	7	41									
46	30	26	21	29	29	34	38	33	-13	-9								
48	25	38	30	42	50	69	55	43	-9	-4	67							
50	37	40	29	40	51	63	52	38	-1	-4	23	62						
52	39	38	32	39	43	58	55	23	3	-12	15	49	61					
54	32	30	14	13	17	45	43	35	13	-18	10	20	25	41				
56	-1	19	15	1	11	48	42	23	10	-3	23	30	-9	20	64			
58	24	34	28	9	36	66	49	21	19	10	-1	33	39	42	66	82		
60	8	32	14	6	16	39	38	9	10	-7	24	54	41	45	39	52	75	

** MULTIPLY TAEULAF VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A5. Ft. Sherman—Correlation of July Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	222	226	231	234	237	241	246	252	257	262	265	267	267	267	264	263	261	255
STDV	39	42	57	46	52	53	50	61	57	46	46	44	60	65	62	52	75	88
N	29	32	32	32	32	32	32	32	32	32	32	32	32	72	32	29	24	17
28	84	**																
30	46	56																
32	43	46	71															
34	63	60	63	72														
36	64	61	59	49	73													
38	64	51	49	50	69	70												
40	59	56	48	33	50	35	64											
42	34	40	40	44	60	23	44	67										
44	23	28	32	32	37	37	20	6	35									
46	6	9	12	29	23	29	5	-23	-8	55								
48	21	15	27	17	12	15	8	1	-31	13	28							
50	32	23	30	16	19	20	27	20	-11	-4	-19	65						
52	40	35	24	24	32	15	34	39	21	-14	-16	36	60					
54	26	26	24	34	26	-8	5	28	21	-23	6	14	5	63				
56	53	40	33	52	50	32	38	21	15	-8	26	32	12	50	74			
58	52	44	28	39	25	28	36	10	-15	-22	16	33	24	55	58	87		
60	42	52	34	33	6	10	30	23	8	-15	-2	20	27	68	55	65	84	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A5. Ft. Sherman—Correlation of October Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	224	230	234	239	244	248	252	258	264	268	271	271	271	270	267	263	260	256
STDV	57	55	51	44	40	48	49	44	60	43	36	41	44	48	59	66	75	81
N	22	22	23	23	23	23	23	23	23	23	23	23	23	23	23	22	19	12
28	82	**																
30	83	84																
32	53	70	79															
34	56	74	73	74														
36	73	77	73	77	75													
38	70	70	63	50	57	65												
40	66	64	53	42	52	63	75											
42	62	63	51	26	45	54	43	73										
44	39	55	34	36	29	45	46	61	68									
46	-4	22	5	10	3	10	10	2	12	61								
48	-17	11	8	24	16	12	-19	-27	4	35	67							
50	-16	15	-3	12	7	6	-10	-19	7	29	52	80						
52	15	24	19	16	11	23	8	10	29	3	0	15	47					
54	26	36	32	40	23	37	22	24	17	15	6	7	19	77				
56	37	33	29	33	5	39	28	18	14	24	19	12	15	59	86			
58	55	53	44	39	24	51	45	19	10	15	17	15	19	49	69	86		
60	49	69	42	43	76	55	51	14	28	51	77	51	49	36	53	60	71	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A6. Barking Sands—Correlation of January Temperatures (°K) From 26 km to 60 km

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	220	225	228	233	236	241	247	254	261	266	270	269	268	265	264	262	261	258
STDV	33	39	36	45	51	52	51	65	67	68	64	58	68	68	62	70	55	55
N	47	47	47	47	47	47	47	47	47	47	47	47	47	44	42	42	38	26
28	67	**																
30	50	69																
32	38	64	79															
34	8	47	57	73														
36	5	27	29	51	65													
38	-6	13	4	33	43	72												
40	6	24	23	44	48	55	66											
42	-12	6	26	35	41	43	40	69										
44	-18	8	20	29	38	25	39	48	69									
46	10	28	33	34	24	17	28	29	44	73								
48	1	12	26	20	23	30	30	37	58	52	55							
50	6	13	32	17	20	15	13	28	47	42	42	79						
52	16	39	40	19	19	9	10	20	17	13	22	38	59					
54	19	46	36	32	27	20	24	10	-13	-7	6	-21	0	58				
56	27	58	38	37	36	24	28	8	-12	18	35	-10	-8	34	77			
58	32	56	46	42	24	9	12	12	7	31	47	10	27	48	65	77		
60	16	32	27	24	27	3	-13	-6	5	28	20	27	42	33	31	39	71	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A6. Barking Sands—Correlation of April Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES .8
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	224	229	233	238	243	247	251	256	261	265	266	269	269	268	265	261	258	254
STDV	26	28	29	31	30	34	36	36	42	39	29	39	37	29	39	49	51	48
N	42	43	43	43	43	43	43	43	43	43	42	42	42	42	42	42	36	26
28	47 **																	
30	31	53																
32	45	41	47															
34	12	35	37	55														
36	10	21	13	28	46													
38	15	31	20	26	32	74												
40	22	20	26	11	24	17	31											
42	16	29	34	4	-3	3	10	47										
44	25	46	49	14	10	18	13	33	67									
46	17	28	42	27	16	19	20	47	21	54								
48	14	8	30	25	5	-3	-3	46	12	36	54							
50	22	9	34	16	13	-3	7	28	14	27	32	74						
52	39	26	29	21	27	1	8	21	41	41	29	29	63					
54	47	42	43	46	29	21	18	13	37	49	32	35	39	69				
56	57	37	45	55	28	29	30	31	39	50	29	37	27	46	82			
58	42	39	43	53	33	13	6	16	37	58	30	27	23	52	68	74		
60	59	56	40	64	32	-4	-11	24	38	48	47	54	42	59	72	66	83	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A6. Barking Sands—Correlation of July Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	225	228	231	234	238	242	247	253	259	263	265	267	265	263	261	258	255	252
STDV	21	24	27	24	[illegible]	33	33	38	31	37	41	39	35	40	43	56	75	83
N	41	44	44	44	44	44	44	44	44	44	44	44	44	44	43	39	32	20
28	63	**																
30	37	64																
32	53	51	59															
34	63	50	47	74														
36	47	50	31	52	60													
38	58	66	41	47	52	65												
40	32	50	23	33	23	50	73											
42	41	31	20	56	46	39	37	40										
44	17	22	37	46	44	25	13	-12	39									
46	22	35	48	41	52	18	34	2	10	67								
48	14	29	40	45	44	29	5	-11	14	44	62							
50	24	43	49	56	58	38	23	5	29	24	38	77						
52	42	47	50	52	44	36	36	24	27	22	26	43	70					
54	[illegible]	52	52	52	42	35	43	36	27	24	29	39	58	79				
56	30	66	41	53	39	42	61	50	25	[illegible]	20	8	26	39	70			
58	[illegible]	52	37	27	41	34	48	27	16	29	30	12	27	37	59	78		
60	15	42	34	17	54	34	57	9	5	46	66	23	34	25	57	72	92	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A6. Barking Sands—Correlation of October Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	224	227	230	235	238	242	247	254	259	265	266	269	268	266	263	261	258	254
STDV	25	31	42	37	41	42	43	37	45	48	44	49	41	42	42	48	54	45
N	44	46	46	47	47	47	47	47	47	47	47	47	46	46	45	44	38	24
28	51	**																
30	72	70																
32	71	65	83															
34	62	53	62	82														
36	39	30	48	59	57													
38	25	7	22	41	58	58												
40	-2	-5	5	14	21	38	51											
42	4	6	19	8	16	20	20	42										
44	27	14	13	19	28	8	31	12	50									
46	48	38	30	33	42	36	36	21	47	62								
48	39	39	30	39	46	41	32	28	41	33	72							
50	48	40	42	45	61	32	39	30	49	34	55	78						
52	57	33	48	50	53	47	45	26	45	34	71	61	66					
54	51	40	44	38	46	51	35	10	36	23	55	37	41	77				
56	50	41	39	41	56	46	38	3	25	41	54	30	33	58	77			
58	42	42	39	31	48	52	34	9	30	19	50	38	36	51	69	75		
60	47	66	55	51	49	47	33	22	41	58	58	37	57	43	38	57	44	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A7. Cape Kennedy—Correlation of January Temperatures (°K) From 26 km to 60 km

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	220	224	228	232	236	241	247	255	263	269	271	270	267	264	261	260	259	257
STDV	38	52	57	49	53	67	72	66	71	64	60	61	48	55	57	[illegible]	61	73
N	41	42	43	43	43	43	43	43	43	43	43	43	43	43	42	41	37	37
28	81	**																
30	77	88																
32	68	65	55															
34	44	56	43	65														
36	22	42	35	38	59													
38	-2	23	19	19	43	81												
40	-2	26	15	12	44	45	63											
42	0	24	18	4	26	38	50	62										
44	-2	21	13	11	21	22	39	55	71									
46	-8	21	13	-6	2	3	26	27	28	68								
48	13	37	24	4	14	12	19	21	18	43	70							
50	11	30	29	-2	-4	12	16	5	0	17	44	71						
52	28	36	42	11	6	20	15	14	-6	-1	7	17	63					
54	43	52	47	41	36	36	13	8	9	1	-16	6	31	64				
56	32	42	25	37	37	30	8	11	12	18	-2	15	20	49	78			
58	14	16	13	1	4	15	4	3	25	20	-1	22	46	44	69	79		
60	22	22	29	-11	4	19	-1	-8	22	6	-8	2	34	40	61	57	84	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A7. Cape Kennedy—Correlation of April Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	224	229	233	237	242	246	252	256	261	265	269	270	270	268	266	264	260	256
STDV	28	34	77	39	39	38	35	28	36	33	28	30	32	76	38	47	52	68
N	45	45	45	45	45	45	45	45	45	45	45	45	45	45	45	44	41	35
28	76	**																
30	65	76																
32	56	56	79															
34	52	42	59	71														
36	13	-5	27	43	54													
38	8	-7	23	39	36	74												
40	10	-8	3	42	35	33	46											
42	1	-20	-27	-7	-10	-1	10	41										
44	11	-9	-29	-11	-4	-19	-12	23	65									
46	27	-2	-17	-15	-6	-16	-5	10	19	45								
48	3	2	-18	-22	-1	-11	-5	4	4	17	69							
50	-2	-3	-8	8	10	-2	12	58	34	34	33	42						
52	17	9	5	25	5	-4	19	62	47	41	20	14	77					
54	26	19	20	34	25	14	29	66	38	34	24	22	58	74				
56	35	17	26	49	40	32	26	63	30	39	28	17	38	52	79			
58	51	38	40	49	29	21	17	50	30	34	2	-13	29	54	73	82		
60	43	29	27	37	15	28	37	55	32	22	6	-9	34	54	68	65	82	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A7. Cape Kennedy—Correlation of July Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	225	229	232	236	240	244	250	255	260	264	266	267	266	263	261	257	254	251
STDV	31	29	30	37	27	38	38	44	37	44	51	49	49	56	62	71	89	103
N	48	49	49	49	48	48	48	40	49	49	49	49	49	49	49	48	44	36
28	75 **																	
30	72	64																
32	60	45	67															
34	59	59	50	68														
36	68	56	57	47	67													
38	44	59	40	26	46	51												
40	25	41	35	33	27	11	31											
42	43	48	55	59	44	41	22	55										
44	[illegible]	48	52	51	45	34	35	5	40									
46	38	30	40	43	28	34	22	-16	17	75								
48	39	38	47	57	44	53	37	0	25	48	75							
50	36	41	43	61	57	55	42	18	38	26	32	73						
52	41	44	53	54	60	52	39	28	39	20	5	40	81					
54	58	49	54	51	64	59	41	38	52	24	-4	18	51	80				
56	73	56	53	50	65	66	40	27	42	33	9	20	37	59	82			
58	66	48	47	44	61	52	34	28	31	33	16	13	20	40	68	90		
60	68	56	45	37	55	55	39	33	27	21	18	15	14	26	52	78	89	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A7. Cape Kennedy—Correlation of October Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES A[illegible] [illegible]CH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	224	227	231	233	237	242	247	252	259	264	267	269	270	267	265	263	260	257
STDV	30	33	42	41	46	46	48	44	48	46	43	43	40	50	63	66	78	80
N	45	45	45	46	46	46	46	46	46	46	46	46	46	46	46	45	38	33
28	79	**																
30	77	72																
32	67	70	85															
34	52	51	68	71														
36	43	41	48	59	68													
38	25	41	39	52	58	70												
40	31	42	32	40	57	57	74											
42	37	40	34	42	56	55	69	71										
44	38	41	36	40	45	49	51	47	62									
46	43	43	38	36	40	31	40	44	51	75								
48	44	50	37	31	31	36	35	43	43	59	77							
50	52	54	49	45	42	46	39	46	42	58	72	86						
52	62	51	64	51	52	52	45	44	51	61	68	68	74					
54	55	39	51	42	49	42	36	33	51	69	73	61	63	86				
56	58	42	53	38	42	36	25	23	45	50	54	51	53	68	85			
58	47	42	52	46	48	42	43	49	48	56	61	61	62	66	76	88		
60	46	33	47	45	45	39	44	34	48	48	50	51	55	54	67	77	90	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A8. White Sands—Correlation of January Temperatures (°K) From 26 km to 60 km

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	220	222	226	230	233	239	246	253	260	267	270	269	267	263	260	257	254	254
STDV	40	42	54	61	62	65	89	93	87	81	71	61	47	55	62	73	76	92
N	43	47	50	50	50	50	50	50	50	50	50	50	50	50	49	46	43	37
28	86 **																	
30	58	75																
32	36	45	83															
34	33	39	75	88														
36	-3	8	49	65	78													
38	-9	-1	17	38	58	78												
40	-25	-16	-2	13	34	52	80											
42	-14	-17	-7	5	26	35	64	81										
44	-24	-33	-22	-11	1	19	44	54	69									
46	-16	-26	-27	-20	-8	14	33	47	57	71								
48	-13	-25	-26	-10	2	23	31	45	59	61	74							
50	2	-2	-6	8	15	21	25	31	40	44	45	72						
52	15	13	-6	4	0	-4	3	-1	10	7	15	38	68					
54	14	26	2	4	5	7	10	7	5	-8	0	16	39	73				
56	36	37	6	1	2	-9	-14	-13	-5	-19	-13	3	25	59	84			
58	32	37	-5	-11	-12	-17	-23	-15	-9	-20	1	13	27	49	65	81		
60	21	27	-10	-18	-25	-27	-35	-30	-21	-25	4	3	22	42	47	64	89	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A8. White Sands—Correlation of April Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	222	226	230	235	242	247	251	258	263	267	269	270	270	269	266	263	260	257
STDV	36	40	41	39	42	40	41	47	51	45	47	37	33	35	42	42	53	54
N	40	50	51	51	51	51	51	51	51	51	51	51	51	51	50	48	45	43
28	82	**																
30	70	80																
32	48	56	70															
34	26	39	54	69														
36	9	17	45	54	74													
38	4	-3	13	28	44	66												
40	18	4	10	19	24	38	68											
42	6	-13	-12	-13	-13	6	40	65										
44	-2	-11	-21	-27	-23	-7	24	39	64									
46	7	-9	-20	-29	-18	0	29	29	41	81								
48	19	-6	-14	-22	-16	-5	18	18	39	58	67							
50	14	-1	-7	-23	-12	-5	18	25	38	64	71	65						
52	38	5	-7	-21	-20	-13	11	17	32	50	53	62	76					
54	47	20	3	-7	-19	-15	11	14	27	39	51	47	71	79				
56	28	7	1	-11	-9	-12	14	21	28	33	54	44	58	57	78			
58	17	5	-3	-11	-9	-2	31	37	38	34	48	36	52	41	65	86		
60	11	2	3	-10	-10	5	21	25	23	14	30	11	38	32	55	62	74	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A8. White Sands—Correlation of July Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	225	229	233	237	240	245	250	255	261	265	268	269	268	266	263	260	256	252
STDV	24	33	36	34	43	41	47	51	49	40	35	42	43	52	61	64	71	74
N	38	43	44	44	44	44	44	44	44	44	44	44	44	44	43	42	39	35
28	72 **																	
30	67	76																
32	51	63	66															
34	77	73	65	70														
36	67	61	53	56	68													
38	55	60	50	66	57	65												
40	45	59	56	68	54	49	74											
42	48	51	49	51	54	61	46	58										
44	23	39	37	19	26	48	21	29	78									
46	2	17	23	-11	4	20	-7	2	32	60								
48	17	25	22	13	15	10	1	11	17	17	41							
50	44	37	33	30	34	27	16	28	16	9	12	76						
52	49	47	28	36	39	47	32	31	17	14	7	47	74					
54	49	40	23	27	35	47	35	27	9	7	1	19	53	68				
56	43	28	19	12	30	55	36	18	17	19	14	11	37	65	88			
58	41	33	20	4	33	53	34	13	25	22	28	26	28	55	74	89		
60	62	49	27	2	46	48	39	19	32	30	30	27	15	30	34	50	79	

** MULTIPLY TAEULAF VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A8. White Sands—Correlation of October Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	224	227	229	231	236	239	244	250	256	262	266	267	268	266	263	261	258	255
STDV	34	37	37	44	51	52	50	47	42	44	40	39	43	47	51	57	65	67
N	44	47	49	49	49	49	49	49	49	49	49	48	46	45	45	44	38	38
28	77	**																
30	78	81																
32	65	78	80															
34	70	65	76	81														
36	47	55	58	68	74													
38	59	62	61	66	70	86												
40	48	52	46	57	60	75	78											
42	44	49	44	54	61	65	71	71										
44	35	42	36	47	50	51	54	53	71									
46	54	50	46	47	57	64	68	63	70	79								
48	45	44	42	45	55	60	55	55	62	62	80							
50	53	34	45	40	52	48	49	34	48	49	63	78						
52	46	29	44	41	51	41	41	26	37	46	58	68	82					
54	34	24	37	35	48	43	35	23	25	35	52	66	75	90				
56	32	23	44	31	45	35	27	5	16	24	42	59	71	81	88			
58	31	36	54	42	48	47	42	18	27	26	49	60	70	74	82	94		
60	35	38	57	49	56	60	48	27	34	35	53	64	73	77	82	87	93	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A9. Primrose Lake—Correlation of January Temperatures (°K) From 26 km to 60 km

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	223	223	224	225	228	229	231	235	238	241	245	250	251	252	250	250	251	249
STDV	61	61	78	88	99	107	106	118	108	124	113	133	129	119	100	131	156	178
N	20	21	21	21	21	21	21	21	21	21	21	21	21	21	18	17	16	12
28	88	**																
30	83	92																
32	71	81	92															
34	65	82	88	96														
36	62	81	83	90	96													
38	48	65	71	78	82	89												
40	27	50	54	64	70	81	90											
42	9	39	39	53	59	72	84	91										
44	-1	17	21	36	41	52	78	78	85									
46	2	18	19	29	37	47	72	75	74	90								
48	-21	-20	-20	-9	-5	6	40	44	46	77	82							
50	-25	-24	-30	-22	-17	-4	32	32	40	73	75	96						
52	-22	-31	-34	-29	-28	-19	15	9	12	50	66	88	92					
54	18	-4	-19	-32	-28	-23	-13	-20	-29	-3	24	39	54	80				
56	23	-6	-13	-29	-36	-40	-29	-37	-51	-33	-9	10	20	55	81			
58	18	-9	-21	-38	-45	-51	-38	-46	-55	-50	-29	-13	2	36	65	92		
60	33	4	-13	-36	-47	-53	-37	-55	-66	-56	-26	-7	13	39	65	87	97	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A9. Primrose Lake—Correlation of April Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	221	223	226	231	235	241	247	254	260	266	270	272	272	272	271	270	267	265
STDV	28	30	37	50	52	60	63	77	68	63	57	54	51	48	49	56	50	57
N	32	32	32	32	32	32	32	32	32	32	31	31	31	30	30	30	26	21
28	78 **																	
30	58	82																
32	35	62	85															
34	25	49	70	91														
36	9	31	59	81	91													
38	5	21	46	70	84	91												
40	-12	8	30	61	76	86	93											
42	-6	6	21	52	70	77	84	90										
44	-13	6	20	49	63	70	79	86	91									
46	-25	-2	15	50	63	75	82	90	86	90								
48	-10	2	18	54	66	74	83	87	83	77	85							
50	0	-1	7	38	58	66	76	81	80	74	75	91						
52	-7	-2	3	36	52	56	69	74	72	73	75	86	90					
54	-25	-16	3	36	52	56	67	69	69	65	74	78	72	81				
56	-20	-11	1	32	49	46	50	55	53	44	57	73	63	68	87			
58	-6	-5	-1	28	43	36	44	54	62	56	60	75	71	67	71	82		
60	-11	-18	-9	14	25	25	20	30	36	13	34	51	48	28	38	50	76	

** MULTIFLY TAEULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A9. Primrose Lake—Correlation of October Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	218	219	220	222	225	229	233	238	244	248	253	257	259	259	259	259	257	256
STDV	46	51	52	56	59	63	65	70	73	71	64	64	61	64	69	65	63	72
N	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	31	26	23
28	91	**																
30	78	91																
32	71	86	95															
34	71	79	92	94														
36	69	78	86	87	89													
38	62	70	81	84	89	92												
40	56	64	72	80	81	83	91											
42	48	52	63	71	72	81	83	90										
44	49	49	55	62	68	77	81	85	93									
46	42	45	52	58	59	65	74	76	86	87								
48	36	36	43	48	53	55	68	74	79	84	89							
50	32	35	40	49	48	48	63	72	77	79	84	91						
52	25	25	31	40	39	35	52	63	67	71	80	89	94					
54	20	26	29	39	28	26	40	54	51	52	61	67	70	80				
56	15	13	15	23	10	6	17	32	26	25	24	36	42	57	80			
58	-8	1	-4	4	-14	-14	-4	9	-2	3	0	12	16	33	71	86		
60	-28	-12	-17	-9	-23	-18	-8	4	-4	-1	-5	0	4	10	54	61	85	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A10. Poker Flats—Correlation of January Temperatures (°K) From 26 km to 60 km (Cont)

KM KILCMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	224	224	225	225	227	229	231	233	235	238	240	245	247	249	250	250	257	257
STDV	96	99	108	118	120	133	146	137	151	150	146	138	120	101	110	130	137	136
N	31	32	32	32	32	32	32	32	32	32	32	31	31	28	27	22	16	12
28	96	**																
30	92	96																
32	81	87	93															
34	63	70	78	93														
36	45	53	64	84	95													
38	26	36	46	69	88	95												
40	13	23	33	57	80	88	97											
42	10	21	30	51	75	81	92	95										
44	10	23	33	52	73	81	88	92	95									
46	5	17	26	44	64	71	79	86	91	97								
48	-14	-3	4	21	40	48	59	68	80	82	89							
50	-41	-30	-24	-9	11	22	37	51	63	65	73	92						
52	-60	-60	-60	-54	-38	-26	-10	8	19	22	33	55	83					
54	-52	-58	-60	-67	-63	-56	-45	-24	-22	-18	-5	19	49	90				
56	-56	-67	-66	-78	-77	-70	-63	-48	-38	-32	-18	4	32	68	93			
58	-43	-52	-53	-73	-82	-82	-80	-73	-68	-71	-69	-52	-25	20	66	88		
60	-16	-24	-32	-95	-69	-83	-84	-84	-88	-90	-89	-82	-65	-30	19	54	88	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A10. Poker Flats—Correlation of April Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	225	226	228	231	235	240	246	252	259	264	269	271	272	272	273	271	268	265
STDV	45	47	50	52	58	59	66	78	82	79	66	67	66	67	53	57	67	76
N	34	34	34	35	35	35	35	35	35	35	35	35	35	34	31	26	20	15
28	95	**																
30	83	92																
32	70	80	90															
34	42	55	67	88														
36	10	18	28	52	66													
38	-6	4	12	39	60	93												
40	-22	-12	2	32	57	84	91											
42	-22	-14	-3	27	52	76	83	92										
44	-26	-19	-12	17	43	74	82	88	95									
46	-16	-5	8	30	50	74	77	86	89	88								
48	-21	-11	-2	22	42	70	72	77	82	86	89							
50	-37	-27	-18	9	34	56	65	75	82	88	84	93						
52	-39	-29	-21	1	25	51	57	69	76	84	84	84	91					
54	-36	-29	-25	-3	24	44	50	59	65	71	77	77	83	94				
56	-40	-31	-17	3	31	46	50	62	65	66	70	64	72	89	94			
58	-42	-29	-17	9	31	50	51	58	63	65	69	61	72	90	92	93		
60	-69	-64	-48	-19	12	28	31	51	58	53	54	43	66	79	82	88	91	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table A10. Poker Flats—Correlation of July Temperatures (°K) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
MEAN	232	235	239	243	248	253	258	264	270	275	279	281	281	280	279	276	272	270
STDV	26	26	32	36	31	37	43	49	38	37	30	31	68	80	84	83	57	38
N	27	28	28	29	29	29	29	29	29	29	29	29	29	28	25	20	19	15
28	84	**																
30	84	86																
32	84	82	87															
34	84	77	80	89														
36	75	68	82	87	82													
38	67	58	71	85	81	86												
40	69	61	71	83	82	85	95											
42	68	68	64	74	78	71	70	78										
44	65	69	67	26	43	23	12	19	59									
46	64	59	64	28	43	26	24	33	57	82								
48	44	37	50	64	59	6[illegible]	76	80	50	-4	23							
50	43	38	54	63	46	61	72	69	32	-29	-20	79						
52	33	21	26	61	48	58	72	67	33	-28	-26	71	93					
54	12	1	2	58	46	61	71	67	33	-37	-31	71	90	98				
56	34	7	8	66	55	63	74	68	38	-38	-23	77	86	93	96			
58	57	47	48	74	60	97	70	65	41	-8	5	66	68	73	74	82		
60	43	32	18	64	62	49	53	54	42	-1	12	55	57	57	59	69	85	

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Appendix B

Interlevel Coefficients of Correlation of Density for Altitudes up to 60 km

Table B1. Ascension Island—Correlation of January Density (kg m^{-3}) From Surface to 60 km

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.079	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1170 -3	974 -3	790 -3	643 -3	521 -3	419 -3	333 -3	259 -3	193 -3	137 -3	928 -4	654 -4	468 -4	343 -4	249 -4	182 -4	135 -4	994 -5	735 -5	543 -5	406 -5	304 -5	232 -5	179 -5	139 -5	107 -5	638 -6	655 -6	515 -6	405 -6	316 -6
STDV	5	5	4	5	4	4	5	7	11	13	10	11	13	16	14	13	16	16	18	22	23	21	23	26	30	33	35	33	29	32	36
N	41	41	41	41	41	41	41	41	41	41	41	41	41	39	39	40	40	40	40	40	40	40	40	40	39	39	39	37	36	31	29
2	57	**																													
4	46	29																													
6	23	7	44																												
8	3	23	15	33																											
10	20	22	28	16	31																										
12	35	44	15	-3	15	22																									
14	10	-9	-20	-23	-13	-6	39																								
16	-7	2	-19	-29	-19	-29	15	36																							
18	-19	-19	5	24	11	0	-16	9	19																						
20	-2	-11	-8	-20	7	-11	-13	17	22	40																					
22	1	5	8	-14	0	-10	-3	-28	19	7	7																				
24	27	4	38	-16	-7	19	25	-2	-6	-20	-9	38																			
26	23	1	44	-6	-14	1	22	-10	22	-10	-10	48	71																		
28	9	-3	31	11	-21	-3	21	-15	14	-25	-15	16	30	61																	
30	-10	4	2	3	-33	6	14	-29	6	-3	-24	36	23	49	44																
32	13	27	8	-24	-29	-5	20	-6	38	2	-15	43	30	34	5	61															
34	17	5	23	-5	1	-5	13	0	27	5	-7	36	26	24	-1	19	56														
36	7	7	5	-19	-20	-26	13	2	26	-1	2	31	15	20	7	36	48	71													
38	7	-2	7	-11	0	3	10	-9	8	15	5	14	6	26	2	32	39	33	45												
40	-22	-16	-5	-9	9	18	-7	-24	-11	12	0	6	1	-3	-15	15	3	17	29	61											
42	-24	-15	-6	-17	6	16	-5	-13	-10	0	-9	2	-4	7	-14	22	18	24	30	[illegible]	76										
44	-3	[illegible]	-6	-30	-4	6	-4	6	-4	-20	-13	6	-3	4	-22	20	21	22	29	[illegible]	32	72									
46	-3	23	-14	-24	-2	0	-11	-2	-3	-17	-17	14	-8	-1	-28	29	32	14	28	9	14	49	89								
48	0	21	-18	-25	3	9	-12	3	-18	-10	-17	13	8	-12	-35	10	18	7	18	0	14	37	74	86							
50	-8	12	-24	-19	10	16	-21	1	-5	-7	-21	14	-9	-17	-39	3	12	4	14	1	20	41	73	82	92						
52	-14	5	-28	-16	9	25	-15	2	-8	-12	-13	8	-19	-22	-29	14	17	4	10	-3	15	40	69	76	77	90					
54	-9	12	-23	-14	9	17	-11	4	-7	-11	-12	12	-26	-19	-32	4	11	-12	-5	2	16	43	63	68	68	80	87				
56	-13	7	-26	-27	1	2	-6	9	12	-8	-4	28	-19	-8	-32	0	16	-8	18	10	28	42	53	58	53	60	63	83			
58	-18	10	-27	-20	1	1	-5	8	25	-5	-9	27	-28	8	-21	19	34	7	15	22	27	57	69	72	53	58	62	77	90		
60	-19	-1	-29	-20	-5	-6	-18	3	15	-2	-15	21	-37	-16	-41	15	32	24	24	21	29	62	77	78	61	67	74	80	83	92	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B1. Ascension Island—Correlation of April Density (kg m^{-3}) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	.079	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	56	60
*MEAN	1163 -3	973 -3	790 -3	642 -3	519 -3	419 -3	334 -3	261 -3	195 -3	138 -3	938 -4	652 -4	463 -4	344 -4	249 -4	183 -4	135 -4	996 -5	741 -5	551 -5	415 -5	316 -5	242 -5	188 -5	148 -5	116 -5	911 -6	714 -6	559 -6	437 -6	339 -6
STDV	6	4	3	4	3	5	4	5	9	18	11	14	9	14	11	12	17	14	16	15	15	18	25	20	23	24	20	20	22	21	25
N	29	29	29	29	29	29	29	29	29	29	29	26	28	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	28	26	20
2	15	**																													
4	-11	38																													
6	-23	-10	55																												
8	11	-13	13	18																											
10	-23	22	40	20	45																										
12	-25	-5	42	16	59	63																									
14	-2	-31	4	19	27	-1	28																								
16	23	-43	-27	5	-8	-1	-7	19																							
18	24	-12	-9	-25	-17	-11	-9	0	23																						
20	-2	5	15	-16	-5	8	19	-21	16	29																					
22	4	-25	-23	-12	-8	-1	-18	-10	25	41	2																				
24	14	-22	-24	1	-1	-14	-19	-14	11	51	20	50																			
26	-37	-11	12	18	31	44	28	-15	-27	-24	-6	15	-8																		
28	-20	-21	10	9	1	-3	-5	-27	5	-23	-1	22	17	53																	
30	12	-17	38	16	22	27	30	-17	20	-13	19	9	2	40	53																
32	0	-36	4	0	-2	4	15	-33	38	[illegible]	21	22	10	16	37	71															
34	13	-33	-1	-15	-11	-23	14	0	44	17	43	1	5	-15	12	42	63														
36	11	-38	-3	4	-9	-37	9	-10	36	22	39	5	11	-6	15	31	49	81													
38	10	-23	-21	-13	-14	-34	-1	-12	4	0	29	-1	21	-14	-7	27	35	33	37												
40	38	-24	-40	-9	-28	-52	-53	-10	24	-5	-12	11	27	-8	14	24	36	19	9	53											
42	21	-18	-23	1	-31	-47	-40	-6	27	6	-16	9	36	-31	2	10	38	47	36	29	62										
44	46	-32	-22	-5	-27	-48	-25	11	40	26	9	-1	32	-35	-10	10	37	54	50	39	59	76									
46	42	-17	-14	4	-25	-33	-8	12	30	25	4	-23	21	-47	-42	0	27	39	39	42	49	57	83								
48	43	-5	-3	-2	-14	-36	3	16	21	17	10	-33	15	-44	-34	6	25	43	35	43	47	55	77	90							
50	40	-21	-14	6	-12	-48	-14	6	24	21	21	-20	29	-35	-26	7	27	39	45	60	60	55	81	83	86						
52	17	-36	-9	9	-18	-48	-7	-3	22	29	24	-9	26	-27	-18	13	47	50	56	61	53	54	76	76	76	93					
54	36	-27	9	13	-16	-39	-2	-2	30	29	20	-13	21	-32	-11	25	46	45	42	50	51	46	73	73	79	83	90				
56	36	-29	2	-4	-26	-41	-5	2	23	30	16	-9	21	-39	-15	20	45	51	40	54	53	55	78	73	76	78	86	92			
58	22	-22	-17	-21	-21	-50	-7	-2	7	34	23	-16	40	-32	1	8	27	42	34	58	48	47	61	56	56	68	76	73	89		
60	1	-39	-46	2	-39	-72	-50	1	21	23	-1	6	56	-11	32	13	19	27	28	50	68	68	54	43	50	60	62	57	59	84	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B1. Ascension Island—Correlation of July Density (kg m^{-3}) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.079	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1177 -3	985 -3	794 -3	645 -3	522 -3	420 -3	334 -3	259 -3	191 -3	134 -3	928 -4	661 -4	475 -4	352 -4	257 -4	188 -4	138 -4	102 -4	757 -5	563 -5	421 -5	317 -5	241 -5	185 -5	143 -5	111 -5	869 -6	682 -6	536 -6	422 -6	328 -6
STDV	9	5	4	4	5	7	6	9	15	21	18	16	14	19	20	19	17	17	16	20	22	27	35	37	41	34	36	38	36	36	40
N	45	45	45	45	45	45	45	43	45	45	44	42	38	44	44	44	44	44	44	44	44	44	44	44	44	43	43	43	43	42	36
2	46	**																													
4	44	51																													
6	40	35	48																												
8	36	45	15	12																											
10	13	1	-8	-3	25																										
12	3	-15	-1	14	2	32																									
14	-21	-35	-7	-5	-52	-8	20																								
16	-22	-43	-35	-18	-45	-9	-23	51																							
18	-11	-19	-18	4	-26	-16	-26	27	68																						
20	14	-20	-18	19	-16	-4	-13	20	62	59																					
22	16	-14	-13	14	-1	-3	-4	19	60	51	74																				
24	26	-5	-9	15	-12	15	0	25	66	60	77	82																			
26	-1	-42	-41	-12	-10	3	10	23	53	42	54	64	53																		
28	11	-28	-18	1	7	15	23	15	32	27	34	47	45	73																	
30	4	-34	-42	-6	-2	12	13	3	39	34	41	59	42	75	74																
32	-10	-36	-45	-9	-31	-9	-18	15	46	35	46	47	39	63	45	66															
34	-13	-33	-43	-11	-17	20	11	15	43	47	44	47	52	55	40	59	65														
36	12	-6	-15	27	-8	-3	6	10	29	35	59	7	37	25	10	21	16	33													
38	8	-6	0	11	-5	1	3	20	14	20	36	-4	18	-2	-9	-8	-16	-7	57												
40	11	8	-7	10	-8	2	-5	17	35	38	53	36	45	17	5	15	10	13	66	66											
42	17	3	-2	24	9	6	-3	9	29	29	50	41	44	17	23	26	2	13	62	66	76										
44	15	8	8	31	11	9	15	20	17	17	34	28	28	-1	9	9	-13	4	56	63	66	89									
46	10	13	18	20	16	4	6	19	13	13	29	29	22	-13	-1	2	-23	-6	41	54	58	79	88								
48	0	10	4	22	22	-3	11	5	4	15	19	19	9	-17	-13	-3	-29	-6	37	49	51	72	78	86							
50	20	23	17	31	29	-2	-3	-5	-1	5	14	13	20	-27	-18	-17	-34	-9	39	59	52	72	74	76	85						
52	22	20	13	32	24	-3	-10	4	6	13	22	11	21	-25	-9	-11	-30	-12	43	63	53	72	73	73	74	92					
54	16	17	12	28	15	-4	-8	10	11	12	21	11	18	-25	-11	-9	-27	-17	48	68	63	73	73	72	69	85	94				
56	14	24	16	30	12	-4	-12	6	12	7	16	11	13	-29	-21	-16	-32	-22	45	55	58	67	66	72	71	83	85	92			
58	20	22	18	36	18	3	-6	0	6	4	13	10	14	-26	-18	-17	-37	-18	40	44	51	64	62	67	70	80	79	82	95		
60	11	0	5	34	1	2	0	8	3	14	12	4	12	-17	-3	-1	-26	-8	40	51	53	69	62	57	71	69	69	73	82	85	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10
** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B1. Ascension Island—Correlation of October Density (kg m^{-3}) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	.079	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1179 -3	978 -3	792 -3	643 -3	520 -3	420 -3	334 -3	260 -3	193 -3	135 -3	938 -4	659 -4	470 -4	347 -4	252 -4	185 -4	136 -4	101 -4	745 -5	558 -5	420 -5	318 -5	243 -5	188 -5	147 -5	115 -5	908 -6	716 -6	563 -6	441 -6	343 -6
STDV	5	8	4	5	3	4	5	8	9	21	16	10	13	17	16	14	12	13	17	19	19	24	26	26	27	32	34	32	29	30	34
N	47	47	47	47	47	47	47	47	47	47	47	46	46	46	47	48	48	48	48	48	48	48	48	48	48	47	48	48	46	42	38
2	23	**																													
4	26	-11																													
6	6	-23	58																												
8	6	-2	23	36																											
10	14	18	9	-5	39																										
12	-7	11	-2	-16	-1	51																									
14	-15	-1	-14	-8	-1	-11	35																								
16	-17	-21	-4	8	15	-26	-33	-10																							
18	7	-27	23	29	27	-18	-44	-30	49																						
20	16	5	-7	9	18	-19	-55	-23	43	53																					
22	-30	-7	-37	-21	-4	-22	-27	-19	46	30	39																				
24	14	8	-4	6	19	-8	-30	-22	50	33	59	33																			
26	-5	13	3	7	36	25	18	17	18	-1	7	18	27																		
28	4	27	-18	-18	7	20	15	9	6	-14	3	12	22	77																	
30	27	18	-9	-9	-10	2	15	8	-13	-30	-13	3	-5	46	57																
32	-3	-10	7	9	-7	-13	-13	-20	13	6	-9	26	8	32	37	45															
34	-39	-21	-12	-21	-9	-6	-1	-1	15	10	-15	34	4	22	10	3	34														
36	-40	-24	-12	3	-6	-20	1	24	12	5	-15	14	-6	15	-1	1	27	65													
38	-39	-36	-21	-2	-23	-32	-5	13	29	4	-16	26	3	9	-8	-6	20	61	68												
40	-38	-27	-35	-23	-21	-16	5	20	23	1	-13	35	-18	4	-4	-5	8	61	46	69											
42	-38	-16	-37	-16	-28	-21	7	31	5	-15	-17	29	-16	-3	-3	-8	8	46	53	61	78										
44	-45	-24	-19	5	-18	-19	-3	16	3	-12	-22	25	-17	-11	-15	-8	18	49	58	58	69	83									
46	-41	-28	-5	18	-10	-26	-19	17	6	-1	-2	15	-14	-16	-28	-18	8	47	58	52	61	72	88								
48	-42	-18	-18	8	-17	-27	-14	19	10	-10	-5	17	-14	-10	-19	-14	3	40	50	52	64	72	84	90							
50	-50	-15	-23	2	-26	-28	-13	18	5	-8	-15	19	-18	-28	-31	-25	-2	45	55	56	68	77	86	87	91						
52	-48	-21	-22	-3	-23	-25	-11	21	11	-2	-7	28	-15	-20	-29	-25	-6	50	54	60	74	82	87	87	95	94					
54	-51	-20	-21	-9	-20	-19	-8	21	13	0	-4	26	-18	-15	-25	-27	-7	48	50	59	74	81	83	85	80	85	95				
56	-42	-10	-10	-6	-19	-29	-20	19	16	10	1	22	-16	-19	-28	-32	-8	39	43	57	67	76	77	85	78	82	89	94			
58	-36	0	-14	-11	-20	-28	-11	18	16	9	3	29	-7	-17	-15	-26	6	43	45	55	68	75	76	81	75	83	88	88	93		
60	-38	-11	-22	-12	-36	-38	-13	22	34	14	10	36	13	-18	-14	-22	12	43	47	55	66	73	72	75	77	87	86	81	84	94	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B2. Kwajalein—Correlation of January Density (kg m^{-3}) From Surface to 60 km

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	.008	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1167 -3	969 -3	786 -3	639 -3	516 -3	416 -3	332 -3	261 -3	199 -3	141 -3	934 -4	654 -4	464 -4	342 -4	248 -4	182 -4	133 -4	980 -5	725 -5	538 -5	401 -5	303 -5	230 -5	175 -5	134 -5	105 -5	818 -6	643 -6	504 -6	397 -6	314 -6
STDV	15	5	4	4	5	4	5	5	10	28	15	13	12	18	15	15	17	18	16	18	21	20	23	28	22	28	28	33	34	37	37
N	42	42	42	42	42	42	42	42	42	42	42	42	41	40	41	42	42	42	42	42	42	42	42	42	42	42	42	42	41	36	34
2	17	**																													
4	17	37																													
6	-4	7	22																												
8	-9	-24	2	14																											
10	9	10	17	9	56																										
12	7	17	1	21	44	74																									
14	9	-9	-23	3	23	27	49																								
16	2	7	-36	-11	-7	-10	4	29																							
18	-3	2	-22	-32	-37	-37	-14	-9	52																						
20	-1	9	8	19	7	28	17	7	12	15																					
22	1	-2	-22	-28	-25	1	-4	6	21	38	42																				
24	-30	0	-12	16	-6	-16	-5	27	14	7	5	31																			
26	-6	-4	6	-13	-4	4	-2	11	31	15	-5	14	41																		
28	16	14	10	2	-14	-9	1	9	23	3	9	16	37	66																	
30	25	4	13	-14	-10	-8	-5	17	17	4	6	8	21	61	57																
32	15	-6	17	-14	-24	-8	-25	0	-4	-2	7	10	14	30	39	51															
34	0	5	-21	-10	-33	-8	-11	10	27	-5	-2	-3	10	30	24	41	48														
36	6	21	-1	3	-32	-7	-12	-2	7	-7	10	3	-6	3	18	31	35	52													
38	10	-9	-3	12	3	33	16	16	-9	-18	32	0	-1	8	5	32	35	51	55												
40	-1	-16	-24	7	-12	16	14	23	-5	-20	0	18	36	-1	8	14	24	45	36	57											
42	-4	14	4	34	-14	7	11	17	-18	-30	6	10	31	-12	24	15	27	33	39	42	70										
44	2	-3	-18	23	-20	8	12	29	-14	-23	9	16	26	-2	13	19	21	49	34	59	72	83									
46	-5	-15	-5	5	-6	4	3	31	-31	-26	6	16	32	3	4	22	22	31	19	44	47	58	72								
48	9	-20	-12	19	-15	-8	-3	29	-28	-30	-8	-4	34	-1	19	14	33	39	26	42	45	54	61	70							
50	3	-1	12	26	-22	-3	-5	5	-32	-37	-4	-11	14	-1	22	25	34	37	52	44	56	64	63	56	67						
52	-3	7	18	40	-17	5	15	9	-43	-42	14	-1	5	-30	3	-1	7	18	40	35	45	64	62	58	58	82					
54	-2	-8	0	28	-16	0	0	6	-41	-43	9	15	5	-34	-14	-16	2	9	32	25	52	60	63	62	53	67	68				
56	-3	-5	24	26	-14	-3	2	11	-40	-35	6	14	2	-31	-16	-18	-3	-7	19	14	42	56	55	62	41	52	79	96			
58	-9	-6	24	14	-19	5	0	12	-40	-28	7	27	4	-18	-11	-20	0	-6	20	14	35	50	55	67	43	62	61	88	92		
60	-27	5	7	27	-20	6	1	7	-37	-29	4	14	4	-25	-20	-32	-1	6	38	14	29	49	51	58	45	64	83	67	80	91	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B2. Kwajalein—Correlation of April Density (kg m^{-3}) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	.008	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1155 -3	968 -3	788 -3	640 -3	517 -3	417 -3	333 -3	262 -3	197 -3	139 -3	936 -4	653 -4	463 -4	343 -4	249 -4	162 -4	134 -4	988 -5	734 -5	543 -5	409 -5	311 -5	240 -5	106 -5	145 -5	113 -5	889 -6	70[illegible] -6	549 -6	433 -6	337 -6
STDV	6	3	4	5	4	4	5	5	10	15	12	11	13	20	19	16	16	15	17	22	24	20	20	18	19	25	23	23	23	24	27
N	34	34	34	34	34	34	34	34	34	34	34	33	32	32	32	33	33	33	33	33	33	33	33	33	33	33	33	33	32	31	21
2	12	**																													
4	31	65																													
6	18	46	70																												
8	31	27	50	65																											
10	16	36	42	43	53																										
12	8	35	40	29	35	61																									
14	15	18	5	4	1	19	43																								
16	-1	-9	-31	-30	-22	-34	-23	33																							
18	-10	6	-33	-36	-5	5	19	23	18																						
20	-36	7	-7	-5	-22	-10	13	-11	31	-2																					
22	17	-28	-27	-15	5	4	2	4	8	33	1																				
24	-19	-8	-21	-23	-29	-1	1	9	3	13	18	29																			
26	-34	-7	-22	-16	-11	12	19	-1	32	39	49	33	39																		
28	-14	-2	-15	-12	-10	22	13	1	27	33	50	28	31	73																	
30	-23	24	-21	-21	-23	9	6	13	42	53	50	17	36	55	72																
32	-5	10	-11	-29	-22	-18	-2	14	39	35	13	30	45	38	40	61															
34	-4	0	-14	-19	-14	-5	21	0	14	32	7	39	26	45	26	33	61														
36	-16	-1	-17	-28	-39	-24	3	-13	5	33	20	15	43	45	35	34	59	68													
38	-20	11	-20	-29	-40	-12	10	1	15	43	12	26	41	42	21	36	61	69	92												
40	-13	-13	-19	-40	-52	-28	-1	4	26	19	16	21	27	17	14	30	61	52	59	75											
42	-24	-33	-25	-31	-38	-15	-3	-17	14	4	7	13	25	22	22	19	40	40	44	47	75										
44	-18	-17	-27	-19	-38	-11	-8	-1	-7	10	1	19	33	-2	20	18	35	22	45	39	50	67									
46	-9	-26	-28	-38	-46	-36	-24	-2	20	12	1	11	31	5	4	6	41	22	39	42	55	60	72								
48	3	-26	-37	-36	-39	-42	-17	8	12	16	7	28	37	10	8	14	44	23	44	46	58	52	56	71							
50	-6	-34	-46	-36	-45	-38	-12	6	22	20	25	40	36	26	21	19	39	32	42	51	67	57	57	65	86						
52	-10	-25	-29	-26	-44	-19	4	7	11	17	28	28	37	31	25	21	32	35	46	53	69	60	55	53	66	88					
54	-9	-33	-33	-38	-52	-27	-19	3	18	9	17	19	30	24	24	15	23	9	38	33	60	60	64	71	73	61	84				
56	8	-25	-27	-35	-45	-19	-13	9	4	12	-3	40	26	-2	3	6	20	9	13	26	56	54	66	67	65	71	65	79			
58	9	-21	-15	-34	-37	-16	-8	7	-2	19	-10	30	17	-7	-2	3	21	6	14	28	60	58	56	66	62	64	58	73	93		
60	34	-18	5	-4	-18	-36	11	31	0	-1	-26	31	10	-13	-23	-29	20	24	40	35	57	48	49	62	76	75	75	79	82	88	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B2. Kwajalein—Correlation of July Density (kg m^{-3}) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.008	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1170 -3	969 -3	790 -3	642 -3	518 -3	418 -3	334 -3	262 -3	194 -3	134 -3	933 -4	661 -4	473 -4	349 -4	254 -4	187 -4	138 -4	102 -4	754 -5	554 -5	415 -5	313 -5	238 -5	163 -5	142 -5	109 -5	852 -6	669 -6	526 -6	413 -6	321 -6
STDV	4	3	4	4	4	4	4	8	12	14	12	9	10	18	11	14	10	16	16	21	20	24	26	27	27	34	36	36	37	37	43
N	31	31	31	31	31	31	31	31	31	31	31	30	29	26	30	30	31	31	31	31	31	31	31	31	31	31	31	30	30	29	26
2	51	**																													
4	65	78																													
6	32	56	71																												
8	0	32	27	40																											
10	14	49	35	30	73																										
12	25	35	24	32	19	21																									
14	4	15	16	26	-20	-14	-4																								
16	-36	-34	-35	-34	-50	-61	-39	-1																							
18	-35	-51	-52	-23	-8	-15	-8	4	7																						
20	-24	-29	-9	2	-11	-15	-8	-11	20	6																					
22	-33	-57	-44	-29	-41	-55	-6	15	35	38	56																				
24	-28	-43	-9	-11	-19	-28	-12	-3	29	32	50	30																			
26	-28	-50	-31	-34	7	7	-39	-37	25	46	15	29	38																		
28	-55	-18	-25	-14	14	4	-31	4	32	25	15	14	2	41																	
30	-29	-20	-14	-3	-6	-7	-18	21	12	8	32	31	3	1	52																
32	-22	-21	-17	-19	-24	-1	-12	-17	12	35	31	33	26	36	32	31															
34	-9	4	8	3	4	12	-4	-10	14	13	36	37	5	28	26	24	47														
36	-34	-30	-25	-18	0	-4	-13	-27	31	11	52	45	12	22	15	17	26	62													
38	-38	-31	-17	-15	18	-6	-13	-31	23	27	37	33	37	44	34	13	20	40	54												
40	-34	-58	-50	-44	-6	-41	-6	-33	37	30	45	42	48	37	16	-4	-1	3	41	49											
42	-35	-55	-46	-44	-9	-33	-5	-18	37	45	29	38	48	27	12	-4	5	5	47	45	81										
44	-28	-34	-34	-42	-5	-15	2	-29	24	31	31	29	32	20	14	6	8	9	46	35	66	83									
46	-28	-36	-28	-32	-5	-19	-3	-26	24	26	44	38	33	27	24	16	9	16	50	46	69	74	92								
48	-36	-44	-42	-40	-10	-35	-19	-27	42	29	40	54	18	43	22	8	9	24	57	35	76	73	76	81							
50	-38	-40	-41	-34	2	-19	-8	-29	34	34	32	38	20	39	24	-3	2	16	46	28	75	70	77	77	91						
52	-26	-46	-39	-44	-3	-17	-14	-36	27	32	29	24	26	32	10	-3	-1	13	43	31	76	77	79	79	82	89					
54	-15	-41	-34	-50	-6	-18	-8	-29	20	31	27	19	31	19	3	-7	0	5	36	26	77	79	80	72	70	73	92				
56	-24	-40	-39	-47	-4	-25	-10	-36	20	30	33	24	29	27	19	-6	3	0	33	29	85	81	80	70	76	81	82	87			
58	-23	-38	-32	-29	-20	-47	-16	-27	39	23	44	39	34	15	29	1	13	2	39	29	78	75	69	69	75	77	70	72	87		
60	-51	-51	-43	-36	-10	-30	-10	-32	31	29	54	44	37	20	43	27	13	7	59	44	81	82	75	74	73	77	75	77	87	95	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B2. Kwajalein—Correlation of October Density (kg m^{-3}) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	.008	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1157 -3	969 -3	789 -3	642 -3	518 -3	417 -3	334 -3	262 -3	196 -3	137 -3	940 -4	659 -4	469 -4	343 -4	250 -4	183 -4	135 -4	100 -4	743 -5	552 -5	417 -5	317 -5	244 -5	189 -5	146 -5	114 -5	892 -6	703 -6	554 -6	436 -6	340 -6
STDV	5	3	3	4	4	4	5	6	10	13	13	11	11	12	13	15	14	15	18	18	21	26	24	23	23	26	31	34	35	35	35
N	40	40	40	40	40	40	40	40	40	40	40	40	76	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	38	33
2	62	**																													
4	55	73																													
6	43	51	76																												
8	15	32	44	66																											
10	24	41	52	59	70																										
12	5	27	36	44	53	51																									
14	12	2	-15	-9	-4	-28	12																								
16	-15	-16	-42	-40	-37	-42	-32	30																							
18	19	-4	-11	-22	-25	-28	-19	13	25																						
20	1	-23	-28	-26	-26	-45	-24	31	24	34																					
22	30	1	8	14	2	-11	11	37	-15	15	11																				
24	-1	-20	-15	-12	-1	3	15	6	-41	-15	0	27																			
26	-6	-13	-9	-1	20	19	25	18	-16	-19	-17	4	55																		
28	-32	-29	-26	-20	-4	11	11	-12	-21	-12	-21	4	58	48																	
30	-29	-21	-15	-12	6	7	26	-14	-29	-19	-11	11	58	51	72																
32	-35	-34	-37	-29	-3	-8	3	1	17	6	1	7	45	38	61	66															
34	-33	-34	-30	-25	0	-14	7	15	12	-27	8	27	39	41	41	55	63														
36	-38	-53	-24	-25	-22	-38	-25	-7	4	-9	9	20	16	12	34	34	31	50													
38	-25	-49	-79	-21	-23	-21	-14	-1	17	-23	16	20	27	14	16	18	29	41	57												
40	-41	-42	-31	-29	-20	-18	13	-9	-3	-10	3	37	30	-1	27	32	26	47	54	54											
42	-46	-47	-27	-20	-4	-14	11	0	-2	-17	13	32	24	-3	25	36	39	57	65	67	67										
44	-48	-50	-30	-18	6	-12	1	-6	-11	-26	5	10	18	3	15	20	26	47	50	54	62	73									
46	-40	-45	-23	-17	-7	-14	-10	-15	-22	-28	13	21	26	-8	14	23	26	52	52	59	70	80	84								
48	-28	-36	-15	-22	-22	-23	-20	-25	-10	-30	2	18	32	-6	21	20	26	36	44	60	68	66	68	80							
50	-29	-38	-19	-17	-28	-29	-17	-22	-10	-30	-2	27	26	-11	33	26	25	41	53	60	72	71	64	74	81						
52	-28	-35	-20	-12	-19	-19	9	-20	-2	-34	-14	19	21	-4	25	22	14	39	42	50	70	64	62	67	79	91					
54	-28	-37	-22	-17	-28	-31	-9	-12	3	-29	0	26	19	-11	19	22	14	42	45	59	74	70	65	73	81	91	95				
56	-28	-39	-20	-21	-27	-27	-14	-14	-5	-27	5	24	14	-7	25	20	11	41	53	60	73	71	63	73	80	90	91	94			
58	-26	-40	-24	-22	-21	-26	-9	-9	3	-23	15	26	16	-6	20	18	18	51	56	66	78	79	69	78	78	85	87	90	95		
60	-32	-46	-34	-34	-25	-30	-4	-7	7	-21	27	23	25	-4	24	27	32	57	55	75	81	64	75	62	79	62	83	86	92	97	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B3. Wallops Island—Correlation of January Density (kg m^{-3}) From Surface to 60 km

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	.015	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1292 -3	1029 -3	921 -3	658 -3	524 -3	411 -3	310 -3	227 -3	168 -3	122 -3	874 -4	638 -4	452 -4	331 -4	241 -4	175 -4	128 -4	936 -5	669 -5	509 -5	379 -5	285 -5	216 -5	167 -5	130 -5	102 -5	601 -6	627 -6	486 -6	376 -6	293 -6
STDV	23	26	16	10	15	35	51	43	41	39	29	40	25	22	23	25	29	36	39	48	50	47	42	44	44	46	47	50	52	55	63
N	44	44	44	44	44	44	44	44	43	43	43	43	43	42	43	43	43	43	43	43	43	43	43	43	43	43	43	43	39	33	10
2	74	**																													
4	66	92																													
6	34	28	53																												
8	-29	-62	-50	25																											
10	-33	-75	-74	-9	86																										
12	-42	-72	-79	-34	61	84																									
14	-39	-79	-83	-31	60	84	92																								
16	-42	-81	-84	-27	63	82	88	97																							
18	-39	-82	-81	-23	63	79	79	92	94																						
20	-37	-76	-72	-9	57	70	67	79	83	92																					
22	-34	-51	-47	-5	33	46	49	49	52	61	72																				
24	-21	-53	-46	2	36	39	40	48	55	69	76	59																			
26	-8	-48	-37	11	38	40	39	44	48	63	70	57	90																		
28	-21	-50	-41	5	45	45	35	41	43	58	62	51	79	83																	
30	-13	-45	-37	11	46	40	34	41	43	55	53	41	65	73	91																
32	-12	-28	-25	-3	21	18	28	33	36	38	29	19	41	46	53	80															
34	-17	-18	-24	-21	9	7	25	23	24	24	10	9	23	20	28	60	86														
36	-27	-17	-25	-32	3	1	23	22	25	20	4	1	14	4	12	38	69	89													
38	-28	-8	-16	-32	-5	-8	9	6	9	3	-12	-12	-2	-16	-10	9	42	71	87												
40	-29	-8	-14	-23	-1	-8	6	3	6	0	-13	-9	-2	-18	-13	9	35	65	81	95											
42	-32	-6	-7	-7	-6	-16	-3	-5	0	-8	-18	1	-3	-17	-12	5	26	51	67	80	87										
44	-34	-7	-5	-1	-6	-13	1	-1	4	-7	-16	3	-12	-22	-19	-2	19	36	53	64	72	89									
46	-30	-6	-2	3	-3	-10	-1	4	8	-3	-13	1	-12	-23	-19	-5	13	30	45	57	66	79	92								
48	-21	-6	-1	4	-1	-8	-2	7	9	-1	-13	-1	-17	-22	-19	-5	8	20	32	42	48	65	79	92							
50	-12	-7	-5	-1	1	0	3	12	13	3	-12	1	-21	-23	-25	-7	1	12	18	24	28	42	60	75	91						
52	-3	0	0	-3	-5	-5	-2	7	7	-3	-18	-10	-29	-31	-30	-13	-8	9	15	19	20	34	48	64	82	94					
54	-1	0	0	-6	-6	-5	-3	7	8	-3	-16	-14	-30	-32	-35	-21	-19	-8	0	3	5	22	42	55	75	88	94				
56	1	6	6	-3	-12	-12	-11	-1	2	-6	-16	-17	-28	-29	-33	-22	-23	-15	-9	-8	-1	13	33	51	74	86	87	95			
58	2	15	15	4	-7	-12	-10	-8	-5	-17	-18	-26	-39	-38	-40	-18	-15	-5	1	4	13	27	44	61	78	88	84	91	96		
60	-6	26	26	-8	-47	-46	-32	-29	-23	-41	-52	-48	-55	-59	-69	-55	-39	-19	-3	10	28	43	59	71	85	92	87	91	93	98	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B3. Wallops Island—Correlation of April Density (kg m^{-3}) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	.015	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1243 -3	1008 -3	814 -3	658 -3	528 -3	417 -3	318 -3	232 -3	170 -3	124 -3	891 -4	641 -4	462 -4	339 -4	247 -4	180 -4	132 -4	972 -5	722 -5	538 -5	403 -5	306 -5	233 -5	180 -5	140 -5	110 -5	862 -6	676 -6	531 -6	418 -6	325 -6
STDV	25	23	12	11	14	23	42	36	29	26	17	12	11	14	17	20	25	30	32	35	40	41	41	44	43	45	48	44	46	53	46
N	48	48	48	48	48	48	48	48	48	48	48	47	45	47	48	48	48	48	48	48	48	48	47	48	48	48	48	48	43	37	30
2	56	**																													
4	60	65																													
6	43	43	88																												
8	20	-1	36	55																											
10	-7	-43	-17	5	61																										
12	-31	-61	-45	-19	35	80																									
14	-47	-60	-59	-42	1	54	84																								
16	-51	-62	-63	-46	-17	32	67	87																							
18	-44	-51	-55	-39	-17	28	60	73	88																						
20	-45	-44	-47	-26	-18	14	49	66	83	88																					
22	-16	-22	-23	-5	-6	7	37	48	64	76	87																				
24	5	-1	3	15	2	-1	12	20	25	31	46	65																			
26	25	-5	13	24	27	23	16	20	15	2	21	42	53																		
28	15	17	17	17	24	14	9	15	4	-3	9	23	31	66																	
30	9	13	7	7	15	14	14	19	9	1	9	19	23	49	84																
32	15	4	2	-3	9	20	14	21	9	-4	3	13	13	55	76	86															
34	8	6	-8	-11	5	26	21	27	13	0	3	9	4	42	64	80	91														
36	10	-10	-11	-12	12	34	29	35	22	5	10	13	6	46	57	71	82	92													
38	11	-12	-12	-14	4	29	24	28	22	8	11	19	12	50	48	56	72	82	90												
40	15	-8	-9	-13	5	25	20	22	19	8	10	17	7	50	50	48	66	75	82	94											
42	7	-16	-8	-12	5	19	15	14	14	5	6	13	6	47	41	44	59	67	73	88	92										
44	5	-17	-14	-12	13	27	23	17	17	13	14	18	9	50	47	50	58	64	66	82	87	94									
46	2	-21	-13	-6	14	27	29	25	25	19	21	28	17	53	44	49	54	62	68	81	83	89	94								
48	3	-19	-14	-11	10	29	27	26	21	15	15	20	11	51	43	49	59	67	70	82	83	87	90	95							
50	0	-22	-13	-6	19	37	34	29	20	13	12	13	4	52	49	54	60	65	70	78	79	83	88	93	96						
52	2	-21	-12	-3	19	35	30	23	19	14	11	13	4	48	47	55	58	62	61	67	70	77	85	88	90	90					
54	3	-14	-7	-1	15	31	26	19	8	4	5	9	5	44	44	56	59	67	66	70	69	78	84	88	91	93	92				
56	3	-23	-10	-1	19	36	30	22	10	8	9	15	6	47	42	53	55	65	65	68	66	72	81	85	90	91	92	98			
58	6	-20	-9	-1	22	41	33	22	8	11	6	8	-11	43	44	56	62	71	70	72	75	77	82	84	90	93	91	96	97		
60	-10	-27	-19	-11	12	37	34	29	16	9	12	5	-25	48	44	57	67	69	64	52	52	58	67	75	82	88	92	94	94	97	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B3. Wallops Island—Correlation of July Density (kg m^{-3}) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	.015	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1192 -3	980 -3	798 -3	647 -3	522 -3	420 -3	333 -3	254 -3	184 -3	131 -3	934 -4	673 -4	486 -4	360 -4	264 -4	194 -4	143 -4	106 -4	786 -5	588 -5	441 -5	332 -5	253 -5	195 -5	152 -5	119 -5	933 -6	734 -6	574 -6	451 -6	352 -6
STDV	14	8	6	5	6	7	9	18	17	14	11	12	12	15	17	18	20	21	22	26	31	32	31	32	36	38	42	42	43	47	33
N	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37	34	30	18
2	77	**																													
4	40	72																													
6	26	55	82																												
8	25	39	55	66																											
10	17	32	42	48	73																										
12	0	16	18	20	27	71																									
14	-16	-21	-16	1	-8	11	42																								
16	-26	-31	-22	-16	-22	-10	21	64																							
18	-7	-5	-4	8	-2	-12	-3	47	75																						
20	-1	13	-6	12	7	-2	-3	24	36	61																					
22	-12	11	-9	10	3	3	18	12	21	35	68																				
24	-11	10	0	14	5	18	23	1	-1	13	63	75																			
26	9	17	2	4	-4	-2	9	5	-4	15	38	70	66																		
28	21	34	10	19	8	12	10	-1	1	22	61	77	75	83																	
30	3	7	-16	-9	-18	-4	5	-4	-3	13	53	67	75	70	84																
32	6	18	-2	-1	-13	-8	8	4	10	30	59	73	75	80	84	86															
34	-3	3	-17	-1	-7	-7	-2	0	-1	20	50	63	65	65	71	73	82														
36	5	11	-19	-5	-10	-9	2	13	7	29	51	67	57	71	75	74	83	88													
38	19	10	-19	-3	-12	-19	-12	11	1	30	48	56	50	73	74	73	81	82	90												
40	4	8	-15	-4	-17	-20	-9	2	-2	22	46	58	55	71	70	76	86	87	90	93											
42	2	7	-18	-5	-19	-22	-1	14	10	28	47	59	48	63	67	75	84	82	90	89	95										
44	21	27	-2	6	-7	-9	2	12	-5	16	44	58	48	71	75	68	80	78	87	88	86	89									
46	14	18	-10	-2	-10	-22	-10	13	-4	20	42	54	43	69	68	63	76	79	88	88	84	86	96								
48	7	7	-24	-9	-14	-20	-8	20	4	29	50	58	48	67	69	67	78	79	90	90	86	88	89	92							
50	12	12	-22	-11	-10	-15	-1	14	4	33	52	58	48	78	70	66	78	78	90	90	86	86	85	88	96						
52	11	5	-32	-21	-15	-22	-4	16	8	33	51	55	39	58	61	62	74	77	89	87	82	86	83	87	92	94					
54	8	5	-31	-21	-17	-25	-4	13	8	33	51	58	42	61	61	60	75	78	89	86	83	85	80	84	89	93	98				
56	9	8	-20	-6	-4	-11	-4	12	9	45	69	56	47	56	65	60	75	77	88	85	82	82	81	82	86	93	93	97			
58	12	6	-22	-5	-6	-17	-15	9	6	40	64	53	38	57	65	60	74	81	91	87	85	83	85	88	90	91	93	95	97		
60	-3	-16	-43	-13	-35	-2	35	50	24	31	29	23	32	32	33	45	55	76	85	78	79	78	73	78	83	93	91	91	92	96	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B3. Wallops Island—Correlation of October Density (kg m^{-3}) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.015	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1229	998	806	651	526	420	328	245	179	127	908	652	470	345	253	186	137	101	747	551	410	367	232	176	136	106	823	643	505	395	309
	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-4	-4	-4	-4	-4	-4	-4	-4	-5	-5	-5	-5	-5	-5	-5	-5	-6	-6	-6	-6	-6
STDV	27	15	11	11	9	10	22	30	33	26	20	17	16	16	16	18	17	21	25	27	34	39	41	49	52	54	57	61	63	65	83
N	43	44	44	44	44	44	44	44	44	43	42	42	41	44	44	43	43	43	43	43	43	43	43	43	43	43	43	43	39	35	26
2	80	**																													
4	66	85																													
6	38	44	60																												
8	47	52	69	63																											
10	13	7	24	36	73																										
12	-32	-46	-29	-14	7	58																									
14	-38	-52	-50	-23	-18	27	73																								
16	-35	-45	-43	-15	-11	24	58	98																							
18	-42	-46	-45	-17	-13	16	43	80	93																						
20	-41	-43	-41	-17	-8	15	33	73	86	94																					
22	-45	-43	-39	-22	-14	11	34	68	81	91	93																				
24	-31	-29	-25	-16	-17	-1	16	51	63	73	77	89																			
26	3	-11	-10	9	-6	5	6	33	36	41	48	58	76																		
28	-3	-7	-2	9	-6	-2	5	27	37	44	46	54	71	81																	
30	3	4	1	10	-5	-9	-5	15	15	20	30	38	55	74	75																
32	-7	-16	-13	11	-6	9	15	30	24	23	31	36	45	63	58	81															
34	3	3	-3	8	-12	-10	-10	6	3	5	15	21	24	37	40	62	76														
36	2	12	7	21	-13	-21	-9	[illegible]	[illegible]	-4	1	6	11	32	44	61	67	83													
38	8	7	10	14	-12	-19	5	5	7	10	14	15	11	27	42	53	65	75	83												
40	4	5	14	19	-5	-12	6	17	7	9	12	15	14	25	38	44	57	68	76	88											
42	4	13	20	26	0	-5	6	16	9	13	14	18	15	23	35	43	53	62	70	81	91										
44	0	13	25	28	3	-2	9	16	6	9	8	12	10	18	29	39	47	55	65	78	87	95									
46	2	17	26	28	-1	-11	-5	7	-2	-1	2	9	17	29	33	45	50	60	63	71	82	89	91								
48	5	14	25	30	3	-4	4	15	6	5	5	9	13	22	22	35	48	54	60	70	85	90	92	93							
50	5	14	24	26	0	-9	4	17	8	4	3	9	15	24	22	36	44	48	55	64	82	86	88	91	98						
52	3	12	20	28	-2	-10	2	19	11	8	5	11	15	23	22	34	43	49	54	63	79	87	90	93	96	97					
54	5	13	19	24	-4	-13	-1	17	10	8	6	18	13	28	18	31	40	46	58	59	77	86	87	89	94	95	98				
56	0	12	18	12	-5	-16	1	14	6	5	5	11	9	10	11	23	32	44	49	58	77	86	86	86	92	93	96	99			
58	8	22	25	22	1	-19	-7	7	0	-4	-5	2	1	11	11	27	33	40	50	55	73	84	82	83	89	91	94	97	99		
60	3	16	19	29	28	18	5	19	5	3	0	5	7	19	3	26	28	22	29	34	59	71	77	67	76	77	82	83	82	85	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B4. Churchill—Correlation of January Density (kg m^{-3}) From Surface to 60 km

KM KILCMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	.035	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1446	1078	848	666	511	375	273	201	148	109	806	591	439	312	227	166	120	881	641	471	347	256	191	142	108	814	625	479	372	286	220
	-3	-3	-3	-3	-3	-3	-3	-3	-3	-3	-4	-4	-4	-4	-4	-4	-4	-5	-5	-5	-5	-5	-5	-5	-5	-6	-6	-6	-6	-6	-6
STDV	31	19	15	12	24	26	22	20	20	26	30	38	33	65	79	92	106	118	126	129	138	144	153	150	149	151	154	160	163	138	140
N	50	50	50	50	50	50	50	50	46	40	30	29	23	43	46	46	46	46	46	46	46	46	46	46	46	46	46	46	44	41	34
2	72	**																													
4	36	70																													
6	7	8	60																												
8	-6	-36	-8	55																											
10	-25	-49	-22	33	99																										
12	-34	-50	-24	20	71	94																									
14	-46	-55	-25	12	57	81	92																								
16	-49	-49	-19	0	37	63	76	99																							
18	-39	-26	-6	-3	15	[illegible]	42	52	85																						
20	-45	-22	3	4	-2	9	17	35	60	91																					
22	-38	-18	6	6	-11	-3	2	18	45	81	96																				
24	-26	21	56	41	-4	-3	1	11	31	72	91	98																			
26	-43	-28	8	21	-2	6	9	26	43	67	83	91	92																		
28	-47	-33	1	18	0	7	10	29	41	61	76	85	66	98																	
30	-43	-30	-1	17	-3	1	1	20	30	51	62	72	76	94	98																
32	-40	-30	-2	16	-4	-2	-4	15	24	43	54	65	69	90	96	99															
34	-34	-25	-4	12	-7	-8	-11	7	14	35	44	55	57	84	92	97	99														
36	-34	-29	[illegible]	11	-5	-7	-11	7	14	33	33	44	44	81	89	95	97	99													
38	-29	-29	[illegible]	9	-3	-6	-11	5	11	26	22	32	29	76	85	92	95	97	99												
40	-25	-27	-2	8	-3	-8	-14	1	6	19	12	23	20	69	90	87	91	95	97	99											
42	-26	-29	-11	9	-2	-8	-14	-1	3	13	6	19	23	66	77	85	89	92	94	95	98										
44	-28	-30	-13	4	-5	-10	-14	0	3	10	5	18	20	64	75	82	86	89	90	93	94	98									
46	-32	-32	-13	2	-5	-8	-9	5	8	11	3	16	18	60	71	77	80	82	83	85	87	93	97								
48	-33	-33	-14	0	-2	-3	-4	8	9	10	3	16	18	56	67	71	73	74	75	77	79	87	93	98							
50	-34	-32	-16	-6	-2	-2	-1	10	10	10	7	17	18	47	56	60	61	62	62	64	66	76	84	92	97						
52	-35	-32	-16	-5	-1	-1	1	10	8	6	4	13	12	38	48	51	52	52	52	54	56	68	76	86	93	99					
54	-35	-31	-15	-5	-1	0	2	9	7	2	3	12	11	32	41	45	45	45	45	47	50	62	71	82	89	96	99				
56	-35	-30	-12	-5	-1	1	4	7	5	-2	3	12	12	29	35	39	37	37	36	39	41	54	64	76	86	92	97	99			
58	-32	-40	-35	-15	-4	-4	-3	-2	-7	-14	-12	-3	0	23	29	35	36	37	41	46	51	57	63	73	81	88	93	96	99		
60	-49	-42	-31	-6	1	-1	-1	0	-4	-10	-7	1	[illegible]	17	28	37	37	38	44	47	52	57	62	70	76	81	86	90	93	97	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B4. Churchill—Correlation of April Density (kg m^{-3}) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	.035	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1355 -3	1050 -3	838 -3	668 -3	525 -3	394 -3	288 -3	212 -3	157 -3	116 -3	851 -4	625 -4	459 -4	348 -4	249 -4	182 -4	133 -4	969 -5	711 -5	524 -5	388 -5	291 -5	220 -5	168 -5	130 -5	102 -5	794 -6	622 -6	487 -6	382 -6	299 -6
STDV	31	15	11	9	16	28	32	25	26	24	20	18	20	20	22	23	27	31	34	36	41	45	48	50	56	60	64	70	73	79	83
N	42	42	42	42	42	42	42	42	42	42	42	40	36	37	37	38	38	38	38	38	38	38	38	38	36	36	36	36	35	34	27
2	73	**																													
4	51	74																													
6	13	39	72																												
8	-17	-30	-27	23																											
10	-32	-47	-50	-4	84																										
12	-34	-45	-49	-10	61	93																									
14	-46	-51	-47	4	65	69	92																								
16	-50	-52	-43	9	58	77	77	93																							
18	-51	-56	-39	14	57	70	69	87	95																						
20	-48	-47	-33	17	55	71	72	88	95	96																					
22	-37	-35	-20	33	49	64	65	81	90	89	97																				
24	-32	-32	-23	22	32	50	54	66	74	71	62	89																			
26	-14	-25	-11	18	25	34	34	48	57	51	62	70	77																		
28	1	-19	-13	13	20	23	21	30	38	33	42	52	70	90																	
30	9	-14	-3	11	2	0	-2	3	11	7	17	29	51	74	89																
32	4	-14	-7	10	1	-5	-9	-4	6	7	13	20	43	63	80	92															
34	-1	-19	-3	22	15	0	-9	-1	5	7	12	19	34	58	74	85	90														
36	-15	-30	-13	22	27	18	10	19	23	24	29	33	45	57	66	75	82	94													
38	-29	-34	-10	28	28	22	18	30	33	33	36	35	43	58	63	62	69	82	92												
40	-28	-33	-9	27	36	32	27	38	36	33	35	34	41	52	54	47	52	68	93	94											
42	-39	-41	-17	21	36	40	38	51	48	43	45	43	49	55	51	40	40	56	73	85	94										
44	-43	-43	-20	18	35	43	43	53	49	45	47	45	53	53	51	37	37	49	67	81	90	96									
46	-44	-43	-22	16	38	46	44	54	48	42	44	41	48	43	40	25	23	37	56	72	82	90	96								
48	-41	-37	-22	10	33	44	44	55	47	39	42	39	47	42	34	20	18	30	50	67	79	90	95	98							
50	-40	-34	-19	10	31	43	43	52	45	37	42	40	50	41	34	19	15	26	45	60	73	85	93	97	98						
52	-39	-32	-19	6	31	43	43	50	42	34	39	37	47	36	28	13	8	20	38	53	67	81	89	94	96	98					
54	-43	-35	-22	3	29	42	43	50	43	34	39	36	47	37	30	15	10	21	39	54	67	81	89	94	95	98	99				
56	-37	-32	-26	-2	31	43	43	51	43	36	39	37	45	31	25	9	5	16	34	48	62	77	86	91	95	97	98	99			
58	-41	-35	-26	-2	28	43	45	53	44	38	41	38	46	28	20	4	-1	11	31	46	60	76	85	91	94	96	98	98	99		
60	-39	-37	-27	-6	31	48	50	56	43	37	38	36	48	27	28	17	16	24	42	55	70	82	87	91	94	96	98	98	99	100	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B4. Churchill—Correlation of July Density (kg m^{-3}) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	.035	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1236 -3	999 -3	810 -3	654 -3	525 -3	409 -3	306 -3	224 -3	166 -3	122 -3	901 -4	662 -4	487 -4	362 -4	267 -4	197 -4	146 -4	109 -4	813 -5	610 -5	460 -5	349 -5	267 -5	206 -5	161 -5	126 -5	992 -6	765 -6	620 -6	492 -6	309 -6
STDV	21	12	11	10	10	19	39	24	22	20	16	14	12	15	13	12	12	13	11	14	15	16	18	21	22	23	23	25	27	29	32
N	28	28	28	28	28	28	28	28	28	28	28	27	27	28	28	28	28	28	28	28	28	28	28	28	28	28	26	25	25	20	19
2	55	**																													
4	59	85																													
6	49	74	89																												
8	39	43	61	78																											
10	8	-32	-19	-17	29																										
12	-17	-64	-54	-56	-24	69																									
14	-24	-69	-58	-56	-26	63	92																								
16	-32	-75	-64	-60	-32	56	88	96																							
18	-29	-74	-60	-54	-30	50	78	92	97																						
20	-28	-72	-60	-54	-33	44	71	87	93	98																					
22	-33	-72	-63	-57	-39	39	75	86	91	95	98																				
24	-42	-68	-52	-56	-44	33	71	81	85	87	89	95																			
26	-8	-42	-40	-40	-23	44	58	71	72	73	71	71	63																		
28	-9	-7	-37	-42	-17	51	51	63	61	60	57	56	49	93																	
30	-1	-33	-27	-34	-25	38	50	56	54	53	48	51	50	84	87																
32	-7	-23	-28	-32	-21	38	37	46	43	41	37	39	37	72	82	79															
34	10	-19	-26	-36	-29	34	37	37	36	32	27	28	25	60	72	77	88														
36	-27	-38	-43	-56	-46	19	36	35	34	30	28	33	30	29	41	44	63	67													
38	-34	-29	-44	-56	-45	4	14	26	27	26	29	33	34	29	46	40	63	53	71												
40	-25	-19	-32	-42	-37	-6	6	16	25	25	27	25	22	22	36	15	48	45	52	78											
42	-21	10	-3	-17	-18	-5	-6	-4	-1	-3	-3	-3	1	-5	17	6	42	37	44	64	80										
44	-45	-7	-19	-28	-27	-9	-3	-4	-2	-6	-7	-6	3	-23	-3	-12	27	22	52	61	69	85									
46	-51	-28	-29	-48	-39	-18	-7	-6	-2	-3	-2	0	8	-19	-3	-11	26	19	57	68	62	64	85								
48	-42	-17	-18	-21	-31	-30	-15	-17	-12	-14	-16	-14	-5	-23	-9	-14	27	23	50	56	57	60	79	92							
50	-35	-7	-10	-10	-24	-30	-11	-12	-12	-14	-17	-14	-2	-23	-12	-7	33	23	51	51	50	60	78	79	89						
52	-31	9	2	-4	-21	-38	-18	-16	-21	-21	-20	-17	-11	-30	-19	-17	22	14	44	50	50	67	79	76	81	94					
54	-51	-12	-11	-14	-26	-35	-15	-6	-8	-5	-1	1	3	-28	-16	-21	21	9	48	33	56	70	81	81	80	87	95				
56	-64	-8	-10	-13	-23	-37	-24	-17	-16	-13	-8	-8	-7	-42	-29	-34	7	3	44	58	61	71	83	83	80	84	98	96			
58	-49	-10	-26	-24	-28	-24	-17	-19	-16	-17	-14	-13	-15	-43	-31	-41	1	3	37	39	55	71	84	78	76	81	87	92	98		
60	-66	-11	-29	-36	-39	-27	-17	-22	-17	-20	-16	-15	-17	-44	-30	-45	-8	-3	40	41	54	71	85	83	76	74	81	88	95	98	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B4. Churchill—Correlation of October Density (kg m^{-3}) From Surface to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	.035	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	1305 -3	1037 -3	825 -3	659 -3	521 -3	396 -3	252 -3	215 -3	158 -3	117 -3	857 -4	628 -4	459 -4	340 -4	248 -4	181 -4	132 -4	957 -5	698 -5	510 -5	374 -5	276 -5	205 -5	153 -5	116 -5	878 -6	673 -6	519 -6	401 -6	314 -6	245 -6
STDV	28	22	18	14	14	27	35	28	26	22	22	18	20	21	24	27	31	36	43	47	57	66	74	83	90	100	107	115	122	128	129
N	51	51	51	51	51	51	51	51	51	51	47	40	34	44	44	44	44	44	44	44	44	44	44	44	44	44	44	42	41	37	33
2	64	**																													
4	59	89																													
6	53	75	89																												
8	35	9	17	30																											
10	-6	-46	-45	-35	63																										
12	-14	-55	-56	-48	46	93																									
14	-17	-55	-57	-53	41	88	96																								
16	-21	-59	-58	-53	30	79	87	95																							
18	-27	-62	-60	-51	23	71	77	87	94																						
20	-31	-56	-50	-38	11	50	53	68	76	86																					
22	-33	-52	-45	-32	35	68	64	75	85	87	81																				
24	-35	-39	-35	-25	35	63	53	65	76	81	71	96																			
26	-34	-35	-31	-26	39	52	47	53	59	64	63	80	83																		
28	-23	-21	-26	-24	44	47	37	42	44	50	48	69	77	88																	
30	-28	-28	-34	-31	44	55	46	52	54	57	56	75	81	87	95																
32	-17	-27	-32	-21	44	54	45	51	54	59	53	76	77	81	87	92															
34	-18	-21	-29	-20	43	52	43	50	52	56	45	68	69	75	82	87	95														
36	-15	-19	-27	-18	37	47	38	48	51	53	45	64	64	65	72	78	89	95													
38	-10	-22	-31	-18	36	50	42	52	54	54	40	60	54	56	61	68	82	90	96												
40	-7	-21	-27	-16	37	51	45	55	57	57	42	61	55	58	59	66	80	87	94	98											
42	-7	-18	-22	-11	35	45	39	49	52	51	36	54	47	54	55	61	75	83	92	96	98										
44	-8	-18	-22	-11	33	44	37	47	51	49	34	54	49	50	49	56	71	79	90	94	96	98									
46	-9	-18	-21	-11	30	42	36	45	49	47	31	50	44	48	45	51	65	73	85	91	93	96	98								
48	-14	-20	-22	-14	25	41	36	44	48	46	29	49	43	48	44	51	63	71	82	87	90	93	96	98							
50	-14	-15	-18	-12	21	35	30	38	42	39	20	41	37	41	38	44	56	66	78	84	86	91	94	97	99						
52	-16	-18	-20	-13	20	35	31	39	43	41	20	42	38	43	40	45	56	65	77	82	85	90	93	95	98	99					
54	-18	-16	-17	-12	21	34	28	36	41	37	19	42	41	43	42	47	56	64	76	81	84	89	92	94	97	98	99				
56	-19	-16	-16	-12	19	33	29	36	41	38	20	43	42	44	41	46	56	63	74	79	83	87	91	93	97	98	98	99			
58	-22	-16	-21	-19	7	30	28	37	41	38	16	40	36	41	40	44	54	63	76	81	85	89	92	93	97	97	98	98	99		
60	-20	-7	-15	-14	5	22	20	28	32	27	4	29	32	39	43	45	55	62	73	79	82	86	90	91	95	96	97	97	98	99	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B5. Ft. Sherman—Correlation of January Density (kg m^{-3}) From 26 km to 60 km

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	337 -4	246 -4	180 -4	132 -4	969 -5	716 -5	534 -5	398 -5	302 -5	231 -5	177 -5	136 -5	105 -5	823 -6	649 -6	514 -6	409 -6	324 -6
STDV	20	17	20	21	27	24	30	33	34	45	44	44	53	54	51	53	41	42
N	21	22	22	22	22	22	22	22	22	22	22	22	22	21	21	20	15	10
28	67	**																
30	42	58																
32	26	54	78															
34	-2	30	69	81														
36	-19	15	43	[illegible]	61													
38	-1	20	37	54	50	84												
40	-36	-4	-2	20	43	68	77											
42	-12	17	13	36	46	74	76	86										
44	-12	15	10	39	49	66	79	88	94									
46	-24	2	7	40	46	75	79	83	89	92								
48	-14	11	4	39	40	65	74	82	86	91	94							
50	-11	6	-13	18	29	30	40	78	64	78	70	79						
52	-1	12	-18	26	17	46	62	74	79	84	82	87	82					
54	-7	2	-13	28	12	50	61	65	76	79	82	82	68	96				
56	-4	-1	-16	20	8	42	52	61	75	77	77	79	68	94	97			
58	16	17	-20	0	-3	29	66	63	72	76	62	67	50	91	95	95		
60	-38	-13	-45	-31	-29	63	[illegible]	68	86	71	74	74	28	80	92	93	92	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B5. Ft. Sherman—Correlation of April Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	341 -4	248 -4	161 -4	133 -4	982 -5	728 -5	545 -5	418 -5	309 -5	236 -5	182 -5	143 -5	112 -5	877 -6	690 -6	549 -6	434 -6	342 -6
STDV	22	23	19	20	22	27	26	35	40	36	39	36	38	38	43	36	35	39
N	29	29	29	29	29	29	29	29	29	29	29	29	29	29	29	25	21	18
28	83	**																
30	76	80																
32	66	76	83															
34	58	68	68	86														
36	31	47	46	69	81													
38	31	46	54	69	74	85												
40	44	54	63	77	74	74	87											
42	33	46	50	64	65	66	73	84										
44	35	44	55	65	63	63	72	84	91									
46	[illegible]	48	53	69	70	73	83	85	82	87								
48	29	51	55	71	73	81	85	85	84	88	95							
50	19	[illegible]	50	67	68	77	85	83	86	90	92	96						
52	15	30	44	60	63	72	81	79	86	88	89	93	95					
54	15	38	[illegible]	57	59	70	81	82	88	85	89	89	92	94				
56	-2	12	[illegible]	35	33	50	61	67	67	70	69	66	69	68	84			
58	-9	25	31	45	42	58	67	74	78	83	81	79	86	81	89	95		
60	-5	35	42	[illegible]	44	53	74	82	86	88	91	91	93	91	89	90	95	

* MULTIPLY MEAN BY ICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VAL BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B5. Ft. Sherman—Correlation of July Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	349 -4	254 -4	186 -4	137 -4	102 -4	752 -5	562 -5	420 -5	317 -5	240 -5	184 -5	142 -5	110 -5	859 -6	676 -6	529 -6	413 -6	326 -6
STDV	16	20	24	20	22	23	26	34	37	44	49	50	50	50	51	46	42	46
N	22	24	24	24	24	24	24	24	24	24	24	24	24	24	24	23	19	14
28	84 **																	
30	59	64																
32	53	47	64															
34	37	45	50	74														
36	20	34	31	54	79													
38	14	19	12	45	67	75												
40	15	18	4	17	48	54	82											
42	6	19	10	35	67	67	85	86										
44	4	14	-2	29	60	79	79	69	84									
46	2	11	2	34	56	78	78	67	77	95								
48	2	5	-2	26	43	67	74	71	72	88	91							
50	6	9	-1	26	42	63	73	71	70	82	84	95						
52	1	3	-5	23	42	60	81	79	78	79	84	90	91					
54	-3	-1	-7	23	43	62	78	80	80	82	89	87	83	92				
56	6	-2	-13	27	47	69	81	77	91	87	92	87	81	85	93			
58	3	-17	11	42	48	59	77	65	75	79	85	79	72	79	84	96		
60	2	-6	18	28	45	60	84	83	88	81	78	75	71	79	84	91	92	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAF VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B5. Ft. Sherman—Correlation of October Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	335 -4	243 -4	180 -4	131 -4	974 -5	728 -5	547 -5	412 -5	310 -5	237 -5	182 -5	143 -5	112 -5	875 -6	688 -6	544 -6	429 -6	334 -6
STDV	32	35	31	29	21	29	26	29	31	39	50	46	44	51	54	56	47	44
N	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	11	9	4
28	91 **																	
30	38	40																
32	68	78	44															
34	48	63	36	93														
36	49	54	32	93	93													
38	35	41	28	74	77	82												
40	20	29	19	73	85	80	80											
42	25	40	13	78	89	81	73	93										
44	3	20	11	70	78	79	78	88	89									
46	-10	8	-14	56	68	78	73	75	81	93								
48	-22	-2	-4	51	67	68	67	74	78	92	96							
50	-31	-9	10	41	65	56	58	79	75	82	78	89						
52	-17	0	-11	45	66	65	67	70	77	80	92	93	83					
54	-11	4	-13	49	67	69	72	75	80	86	95	93	82	97				
56	-29	-15	7	38	57	61	71	72	73	85	93	92	87	95	99			
58	-39	-17	5	26	48	50	66	58	63	81	95	94	85	96	95	96		
60	-79	-73	-51	-42	-39	-14	2	-53	-57	35	81	74	36	78	86	95	95	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B6. Barking Sands—Correlation of January Density (kg m^{-3}) From 26 km to 60 km

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	342 -4	248 -4	181 -4	132 -4	979 -5	721 -5	535 -5	398 -5	297 -5	226 -5	174 -5	136 -5	106 -5	834 -6	649 -6	506 -6	393 -6	306 -6
STDV	20	23	25	28	29	30	29	27	35	37	35	35	38	37	43	43	45	50
N	47	47	47	47	47	47	47	47	47	47	47	47	47	44	42	42	38	26
28	84	**																
30	73	81																
32	67	79	89															
34	47	64	78	87														
36	32	42	55	68	79													
38	14	21	37	55	65	85												
40	16	21	42	50	61	68	78											
42	22	24	55	51	61	62	66	79										
44	7	12	37	36	48	49	63	61	81									
46	9	4	24	19	23	36	47	42	66	84								
48	-4	-11	14	9	21	39	45	39	66	69	83							
50	-9	-16	11	4	12	26	31	28	57	64	78	90						
52	-18	-14	0	-1	8	23	30	20	40	51	63	73	82					
54	-21	-14	-3	6	13	22	29	12	29	43	56	56	65	84				
56	-17	-11	-1	8	17	23	31	12	32	54	65	59	60	73	92			
58	-17	-16	5	13	20	28	41	29	55	69	74	74	79	78	88	90		
60	-15	-3	16	23	28	34	44	34	60	70	72	75	80	79	85	85	96	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B6. Barking Sands—Correlation of April Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	343 -4	249 -4	182 -4	134 -4	994 -5	742 -5	557 -5	418 -5	316 -5	241 -5	186 -5	144 -5	112 -5	876 -6	688 -6	541 -6	424 -6	331 -6
STDV	14	14	14	14	17	18	17	20	21	20	23	25	25	25	24	24	28	30
N	41	43	43	43	43	43	43	43	43	43	42	42	42	42	42	41	35	25
28	70 **																	
30	41	61																
32	45	46	56															
34	26	46	50	60														
36	19	32	39	44	73													
38	21	37	43	40	65	85												
40	17	23	30	21	49	51	61											
42	10	26	31	13	36	46	54	74										
44	18	31	36	22	47	53	51	65	81									
46	7	14	30	36	53	53	55	59	62	79								
48	-3	0	19	27	41	41	44	58	54	71	88							
50	-1	2	20	28	49	46	51	58	55	67	84	91						
52	8	11	15	30	59	55	55	58	62	68	81	75	88					
54	8	12	18	37	54	56	52	52	56	65	77	72	76	92				
56	14	12	21	41	52	58	55	49	56	60	70	67	67	84	91			
58	-9	10	11	36	51	47	45	46	61	62	72	63	70	85	84	85		
60	-35	-20	-18	36	48	49	42	45	44	43	81	75	75	85	84	79	89	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B6. Barking Sands—Correlation of July Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM	KILOMETERS ABOVE SEA LEVEL
MEAN	AVERAGE OF OBSERVED VALUES
STDV	STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10
N	NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	354 -4	259 -4	190 -4	140 -4	104 -4	771 -5	572 -5	427 -5	321 -5	244 -5	187 -5	145 -5	113 -5	885 -6	690 -6	538 -5	417 -6	326 -6
STDV	13	14	14	15	16	19	20	23	24	26	25	27	27	29	31	33	35	35
N	41	44	44	44	44	44	44	44	44	44	44	44	44	44	43	39	32	20
28	82 **																	
30	60	79																
32	64	68	76															
34	65	64	66	85														
36	55	63	62	78	78													
38	57	66	63	73	70	82												
40	44	56	57	72	62	78	89											
42	35	37	50	72	63	67	70	78										
44	11	22	41	54	52	54	56	58	83									
46	11	24	45	48	52	50	61	59	72	88								
48	12	20	39	51	46	57	55	62	80	82	86							
50	18	24	40	52	49	60	63	67	79	74	77	93						
52	25	25	37	51	45	59	67	73	76	70	70	82	92					
54	25	34	46	54	47	63	75	80	77	71	72	75	86	93				
56	24	35	28	37	31	52	67	67	59	58	58	62	70	69	80			
58	40	43	42	52	59	63	76	73	68	67	69	65	76	76	85	89		
60	31	45	46	51	67	71	79	78	73	77	84	75	78	77	89	89	91	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B6. Barking Sands—Correlation of October Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	348 -4	254 -4	187 -4	137 -4	182 -4	754 -5	561 -5	417 -5	314 -5	238 -5	184 -5	142 -5	111 -5	867 -6	681 -6	532 -6	418 -6	325 -6
STDV	10	11	13	11	13	20	23	27	25	25	23	24	25	27	29	33	33	32
N	42	44	44	45	45	45	45	45	45	45	45	45	44	44	43	42	36	22
28	48 **																	
30	56	51																
32	47	30	50															
34	22	6	17	72														
36	20	10	21	57	59													
38	18	6	12	52	70	70												
40	7	5	5	37	44	64	76											
42	-1	-2	1	7	22	43	55	80										
44	9	1	-12	11	24	29	54	63	72									
46	28	19	-1	21	25	43	51	64	69	77								
48	30	28	10	33	36	46	50	69	60	59	82							
50	29	21	17	34	32	40	55	72	67	63	71	86						
52	16	5	9	26	16	41	51	64	60	61	71	73	86					
54	17	9	10	24	13	35	42	54	51	56	61	63	79	93				
56	15	11	10	28	22	32	44	52	47	62	59	62	78	86	93			
58	21	19	20	26	22	35	45	60	55	56	57	67	80	82	88	91		
60	-19	-9	8	31	22	13	40	59	44	60	38	46	80	73	76	84	85	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B7. Cape Kennedy—Correlation of January Density (kg m^{-3}) From 26 km to 60 km

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	340 -4	246 -4	179 -4	131 -4	965 -5	711 -5	527 -5	390 -5	291 -5	221 -5	171 -5	134 -5	105 -5	830 -6	649 -6	504 -6	391 -6	303 -6
STDV	20	21	21	21	26	30	35	35	39	38	39	34	35	37	35	38	42	44
N	38	38	39	39	39	39	39	39	39	39	39	39	39	39	38	37	34	30
28	83	**																
30	73	84																
32	36	39	31															
34	16	25	22	66														
36	3	14	20	47	69													
38	-21	-11	5	36	62	84												
40	-19	-13	-4	25	53	47	72											
42	0	3	14	33	50	50	56	82										
44	-3	-5	5	34	45	33	57	78	84									
46	-9	-9	-1	20	29	21	47	63	63	86								
48	-8	-9	-7	14	22	13	33	53	55	74	89							
50	-14	-17	-6	20	20	20	39	54	51	68	81	87						
52	-13	-17	-2	18	16	16	30	47	41	55	64	64	91					
54	-4	-7	-6	31	23	13	19	38	43	51	54	56	76	87				
56	-12	-18	-20	32	31	17	26	48	51	63	62	62	74	77	90			
58	-22	-28	-14	23	31	25	39	62	66	71	73	75	84	78	84	89		
60	-18	-24	-3	14	26	23	33	57	62	63	67	57	72	73	79	81	92	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B7. Cape Kennedy—Correlation of April Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	343 -4	249 -4	183 -4	135 -4	997 -5	742 -5	553 -5	417 -5	315 -5	240 -5	184 -5	143 -5	112 -5	874 -6	683 -6	537 -6	421 -6	330 -6
STDV	18	16	14	18	22	26	26	27	32	30	27	28	26	25	23	23	23	27
N	44	45	45	45	45	45	45	45	45	45	45	45	45	45	45	44	41	35
28	85	**																
30	71	72																
32	57	51	75															
34	45	36	55	79														
36	25	17	43	64	83													
38	18	13	33	56	74	89												
40	21	20	27	55	71	74	86											
42	12	9	11	34	53	65	79	91										
44	9	7	3	25	49	59	74	88	93									
46	1	2	-1	15	47	57	72	83	83	91								
48	3	11	8	18	51	59	71	81	78	85	94							
50	2	11	15	33	55	63	76	89	83	86	85	88						
52	6	11	14	30	49	60	74	87	84	85	83	83	94					
54	2	9	15	26	51	63	73	83	79	81	92	92	86	90				
56	7	9	21	33	55	67	67	77	74	79	78	76	75	60	90			
58	19	20	24	21	44	55	52	67	68	70	59	71	72	80	86	87		
60	10	5	22	24	39	61	63	64	61	59	66	66	71	76	78	72	87	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10
** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B7. Cape Kennedy—Correlation of July Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL
MEAN AVERAGE OF OBSERVED VALUES
STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10
N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	357 -4	260 -4	192 -4	141 -4	105 -4	776 -5	577 -5	434 -5	327 -5	249 -5	192 -5	149 -5	116 -5	903 -6	711 -6	556 -6	434 -6	333 -6
STDV	17	13	13	14	14	17	19	22	19	20	26	25	27	28	31	34	42	44
N	44	45	45	45	44	44	44	44	44	44	44	44	44	44	44	42	39	31
28	79 **																	
30	68	62																
32	46	36	70															
34	33	50	51	52														
36	30	35	52	37	77													
38	8	34	37	24	63	67												
40	-21	6	23	15	37	35	59											
42	-19	-3	30	28	46	56	53	72										
44	-5	-2	24	20	47	47	51	39	65									
46	-13	-14	19	23	48	53	52	41	66	90								
48	-21	-12	24	30	54	64	60	53	74	69	84							
50	-19	-2	27	30	57	64	60	61	74	50	61	86						
52	-19	-3	24	18	52	55	54	63	70	43	49	72	92					
54	-17	-7	11	1	49	53	50	59	69	46	46	60	77	92				
56	-15	-12	1	-8	46	53	47	52	64	58	57	61	68	76	86			
58	-17	-12	4	-4	46	44	50	60	62	67	67	69	60	66	80	93		
60	-25	-5	12	12	37	43	57	63	61	53	63	59	59	62	72	86	92	

* MULTIFLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIFLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B7. Cape Kennedy—Correlation of October Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	347 -4	254 -4	186 -4	138 -4	102 -4	752 -5	559 -5	417 -5	313 -5	237 -5	162 -5	140 -5	109 -5	857 -6	673 -6	525 -6	410 -6	321 -6
STDV	16	16	17	16	19	21	24	25	25	28	32	33	33	31	33	37	38	44
N	44	44	44	45	45	45	45	45	45	45	45	45	45	45	45	44	37	32
28	82 **																	
30	74	73																
32	49	64	75															
34	25	37	49	66														
36	1	17	23	49	68													
38	-9	17	15	44	59	76												
40	-7	13	6	31	55	65	81											
42	-20	-4	-5	19	40	56	74	64										
44	-29	-15	-12	11	24	43	56	70	80									
46	-28	-15	-11	10	22	36	54	72	78	91								
48	-22	-7	-8	8	21	42	53	73	75	85	94							
50	-27	-12	-7	10	22	40	49	70	73	83	91	95						
52	-30	-21	-8	5	18	35	47	64	72	60	88	87	92					
54	-35	-29	-14	0	15	30	43	60	73	83	87	84	89	94				
56	-34	-23	-11	-4	10	27	38	57	68	71	79	80	86	87	92			
58	-26	-10	-12	6	24	36	58	72	75	74	81	83	87	85	86	95		
60	-45	-30	-27	-2	22	36	59	63	73	72	79	82	86	84	67	91	95	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B8. White Sands—Correlation of January Density (kg m^{-3}) From 26 km to 60 km

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	338	247	180	131	965	788	522	386	289	218	168	131	103	810	633	494	383	295
	-4	-4	-4	-4	-5	-5	-5	-5	-5	-5	-5	-5	-5	-6	-6	-6	-6	-6
STDV	22	19	25	28	29	34	41	42	42	48	48	46	48	53	55	59	62	69
N	43	47	50	50	50	50	50	50	50	50	50	50	50	50	49	46	43	37
28	83 **																	
30	56	78																
32	43	56	84															
34	37	50	69	83														
36	19	32	49	64	86													
38	6	17	23	45	74	85												
40	-11	-4	-1	18	53	69	82											
42	-5	-8	-12	6	36	54	62	83										
44	-10	-11	-16	-4	20	41	41	62	84									
46	-3	-13	-25	-14	7	32	24	51	73	89								
48	-4	-10	-25	-13	5	27	15	41	66	81	91							
50	-7	-8	-22	-14	-5	12	1	23	47	69	80	92						
52	-11	-16	-29	-23	-18	0	-9	12	38	61	75	86	96					
54	-11	-12	-26	-26	-16	0	-8	12	34	54	78	81	91	95				
56	-5	-8	-24	-25	-15	-2	-12	10	31	56	69	79	89	93	97			
58	-7	-12	-27	-29	-19	8	-12	13	36	63	76	82	89	91	92	96		
60	-17	-21	-32	-32	-22	1	-12	16	40	67	79	83	88	90	89	92	98	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B8. White Sands—Correlation of April Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	345 -4	250 -4	183 -4	134 -4	981 -5	728 -5	545 -5	409 -5	309 -5	236 -5	182 -5	141 -5	110 -5	862 -6	677 -6	533 -6	417 -6	325 -6
STDV	17	17	17	23	25	29	31	34	38	38	38	38	36	39	39	41	41	46
N	40	50	51	51	51	51	51	51	51	51	51	51	51	51	50	48	45	43
28	82 **																	
30	59	73																
32	45	54	76															
34	20	42	63	82														
36	20	31	61	75	87													
38	11	19	42	65	75	90												
40	10	15	31	55	64	78	88											
42	12	16	31	40	58	74	84	87										
44	8	16	26	44	54	70	78	79	90									
46	14	20	29	43	55	71	77	75	84	96								
48	25	20	39	51	59	69	72	72	81	89	93							
50	20	26	37	50	56	66	70	71	79	88	91	95						
52	32	35	42	51	52	63	65	67	75	82	85	93	96					
54	34	36	42	52	51	61	64	66	74	80	85	91	96	97				
56	29	36	45	55	57	65	67	70	74	80	86	92	95	94	96			
58	20	31	41	54	57	67	70	70	72	77	82	87	92	91	94	97		
60	18	31	44	50	53	63	60	61	63	76	75	83	88	90	91	92	94	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B8. White Sands—Correlation of July Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	361	264	193	142	186	784	585	438	330	[illegible]	[illegible]	150	117	919	719	561	438	343
	-4	-4	-4	-4	-4	-5	-5	-5	-5	-5	[illegible]	-5	-5	-6	-6	-6	-6	-6
STDV	24	22	21	20	20	25	29	32	34	42	40	47	44	43	47	47	45	51
N	36	41	42	42	42	42	42	42	42	42	42	42	42	42	41	40	37	33
28	89	**																
30	86	87																
32	77	77	79															
34	82	75	76	81														
36	75	68	69	77	80													
38	66	65	69	83	75	86												
40	57	60	67	78	73	77	89											
42	58	53	62	69	73	81	79	86										
44	47	46	56	61	67	79	76	82	94									
46	42	40	51	58	65	74	74	80	87	96								
48	44	41	51	63	67	70	73	79	82	89	95							
50	46	41	52	64	68	70	73	78	78	86	92	98						
52	41	36	43	61	64	70	72	74	75	84	88	90	94					
54	46	39	46	64	64	76	75	74	79	87	89	87	90	97				
56	44	36	47	58	64	78	76	73	84	90	[illegible]	85	86	92	97			
58	35	26	34	56	61	73	76	70	84	87	89	[illegible]	80	86	91	97		
60	44	36	42	59	62	71	79	73	85	87	87	80	[illegible]	80	80	87	95	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B8. White Sands—Correlation of October Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	344 -4	252 -4	186 -4	137 -4	100 -4	745 -5	552 -5	411 -5	307 -5	232 -5	177 -5	137 -5	186 -5	827 -6	649 -6	506 -6	396 -6	310 -6
STDV	33	31	30	29	30	33	34	36	39	43	44	46	50	49	52	53	56	52
N	44	47	49	49	49	49	49	49	49	49	49	48	48	45	45	44	38	38
28	95 **																	
30	92	93																
32	84	89	93															
34	84	83	89	90														
36	69	72	79	83	87													
38	67	70	77	79	83	92												
40	52	56	65	69	74	84	91											
42	42	47	57	60	66	75	86	92										
44	37	41	52	55	60	69	80	88	95									
46	38	40	51	52	59	70	82	89	94	96								
48	32	34	48	48	56	65	77	86	93	93	97							
50	27	28	43	42	49	57	71	80	89	90	95	98						
52	47	46	55	55	62	59	73	81	86	89	94	97	98					
54	42	43	51	52	60	58	71	81	86	88	94	96	97	99				
56	36	37	46	46	54	52	67	76	83	85	91	94	95	97	98			
58	-10	5	25	34	45	45	65	74	84	80	87	91	91	91	93	92		
60	-1	11	25	31	38	44	68	78	84	63	90	93	92	93	94	95	93	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B9. Primrose Lake—Correlation of January Density (kg m^{-3}) From 26 km to 60 km

KM KILCMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	325 -4	239 -4	175 -4	129 -4	948 -5	700 -5	517 -5	380 -5	282 -5	210 -5	157 -5	117 -5	890 -6	679 -6	522 -6	403 -6	306 -6	247 -6
STDV	43	45	48	55	54	54	64	72	81	92	98	114	116	123	135	140	148	113
N	20	21	21	21	21	21	21	21	21	21	21	21	21	21	18	17	16	12
28	94	**																
30	90	97																
32	83	92	95															
34	74	87	90	98														
36	64	80	81	90	96													
38	42	60	64	74	82	92												
40	27	51	55	66	75	87	95											
42	13	37	42	54	64	78	89	94										
44	11	30	37	48	57	71	88	89	97									
46	7	24	30	40	49	63	78	84	92	96								
48	-1	14	21	31	39	54	72	78	88	93	98							
50	-7	8	14	23	31	46	64	71	85	90	95	98						
52	-10	2	10	16	23	35	51	59	75	80	90	95	98					
54	-12	1	7	7	12	23	35	46	64	71	84	91	95	99				
56	-11	-8	0	-3	1	8	22	34	54	61	76	87	91	96	98			
58	-25	-18	-11	-12	-8	0	13	27	51	[illegible]	71	83	88	93	95	98		
60	-20	-10	-3	-4	-4	-2	17	25	50	50	57	73	78	84	86	92	98	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B9. Primrose Lake—Correlation of April Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	343 -4	251 -4	183 -4	133 -4	979 -5	718 -5	530 -5	394 -5	296 -5	223 -5	171 -5	133 -5	104 -5	608 -6	634 -6	497 -6	391 -6	306 -6
STDV	16	17	23	28	28	30	29	32	32	33	38	42	47	49	53	56	52	63
N	32	32	32	32	32	32	32	32	32	32	31	31	31	30	30	30	26	21
28	87 **																	
30	81	92																
32	77	91	93															
34	70	83	84	94														
36	58	71	75	84	92													
38	41	51	56	66	80	90												
40	30	41	44	57	73	85	95											
42	12	15	19	27	47	61	77	87										
44	-4	-2	3	6	23	41	66	71	91									
46	2	6	9	11	24	41	58	68	84	95								
48	3	2	4	3	15	30	49	57	77	89	96							
50	-1	-9	-8	-12	2	18	36	46	71	86	91	97						
52	-11	-17	-14	-20	-6	9	28	39	66	85	91	96	96					
54	-10	-15	-10	-18	-6	8	26	35	63	82	89	94	95	98				
56	-11	-16	-13	-21	-9	3	19	29	57	77	86	93	94	97	98			
58	-20	-26	-26	-33	-22	-8	14	25	57	81	85	88	91	94	95	96		
60	-21	-23	-24	-25	-15	9	26	38	61	77	85	87	90	90	91	93	99	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B9. Primrose Lake—Correlation of October Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	344 -4	251 -4	183 -4	134 -4	974 -5	710 -5	521 -5	383 -5	282 -5	211 -5	158 -5	119 -5	914 -6	702 -6	542 -6	419 -6	326 -6	253 -6
STDV	16	17	21	26	31	36	42	47	54	64	71	76	81	87	91	100	102	110
N	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	31	26	23
28	81	**																
30	58	85																
32	46	73	92															
34	44	64	85	93														
36	37	57	75	66	91													
38	31	48	70	84	91	95												
40	19	37	59	78	83	90	96											
42	17	33	56	74	80	90	94	97										
44	22	35	53	71	77	88	92	94	97									
46	14	31	49	66	71	82	89	92	95	97								
48	14	30	48	65	69	80	87	91	94	97	98							
50	12	28	45	62	65	77	84	89	92	95	98	99						
52	11	27	44	61	64	75	82	87	90	94	97	98	99					
54	7	24	40	56	58	71	77	83	85	90	94	96	97	98				
56	7	23	39	54	54	68	73	78	82	87	91	93	96	97	99			
58	9	27	41	57	55	66	73	81	84	88	93	95	96	97	98	99		
60	8	27	42	58	56	67	74	82	85	87	92	94	95	95	96	97	99	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B10. Poker Flats—Correlation of January Density (kg m^{-3}) From 26 km to 60 km

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	326 -4	240 -4	177 -4	131 -4	963 -5	711 -5	525 -5	389 -5	288 -5	214 -5	160 -5	119 -5	896 -6	659 -6	510 -6	394 -6	295 -6	230 -6
STDV	41	49	57	69	84	95	106	115	120	125	134	154	172	178	182	193	218	220
N	31	32	32	32	32	32	32	32	32	32	32	31	31	28	27	22	16	12
28	95 **																	
30	91	96																
32	85	93	97															
34	77	88	93	97														
36	70	82	89	94	98													
38	64	77	84	89	96	98												
40	50	65	73	79	89	93	97											
42	44	60	67	73	84	88	94	98										
44	35	52	60	65	76	82	89	95	98									
46	24	40	49	55	66	73	82	91	94	98								
48	12	30	38	45	57	65	75	86	90	95	98							
50	3	21	30	36	49	58	69	81	85	91	95	99						
52	2	21	26	29	37	45	54	65	70	77	81	85	88					
54	-17	3	13	17	29	39	49	63	67	78	85	91	96	87				
56	-8	9	21	22	32	41	50	62	65	76	83	88	95	86	100			
58	-11	10	21	22	32	38	48	60	66	77	84	88	93	87	96	99		
60	-1	17	24	25	37	40	49	59	63	73	80	83	90	84	96	98	100	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B10. Poker Flats—Correlation of April Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM	KILOMETERS ABOVE SEA LEVEL
MEAN	AVERAGE OF OBSERVED VALUES
STDV	STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10
N	NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	344 -4	253 -4	186 -4	137 -4	101 -4	738 -5	546 -5	407 -5	304 -5	230 -5	175 -5	135 -5	105 -5	820 -6	642 -6	505 -6	396 -6	310 -6
STDV	40	43	45	46	50	55	56	57	57	55	56	56	61	64	67	63	69	70
N	34	34	34	35	35	35	35	35	35	35	35	35	35	34	31	26	20	15
28	98	**																
30	94	97																
32	87	91	97															
34	78	84	91	97														
36	63	70	79	87	91													
38	59	67	75	84	90	98												
40	53	61	72	81	88	95	98											
42	51	58	68	77	84	90	94	97										
44	46	53	62	68	76	84	89	92	97									
46	48	54	62	64	68	75	79	84	89	95								
48	39	44	52	55	60	67	73	78	85	93	97							
50	33	38	46	47	52	59	66	72	80	89	95	98						
52	30	34	41	41	45	52	59	65	74	84	93	95	98					
54	29	32	37	35	38	44	49	55	65	78	89	94	97	99				
56	31	34	37	33	35	40	45	47	57	71	83	90	94	97	99			
58	27	31	33	27	28	34	39	41	53	67	78	87	93	95	98	99		
60	-6	9	17	15	24	28	37	40	52	63	80	87	92	92	97	98	99	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B10. Poker Flats—Correlation of October Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	365 -4	269 -4	199 -4	147 -4	110 -4	819 -5	618 -5	466 -5	354 -5	271 -5	209 -5	163 -5	129 -5	101 -5	797 -6	626 -6	499 -6	393 -6
STDV	22	24	23	29	28	29	28	30	39	45	45	43	42	45	46	53	64	80
N	27	28	28	29	29	29	29	29	29	29	29	29	29	28	25	20	19	15
28	96 **																	
30	92	97																
32	89	94	94															
34	82	87	88	97														
36	73	81	84	93	93													
38	63	72	74	88	91	95												
40	61	71	72	88	92	95	98											
42	56	67	69	86	92	92	93	96										
44	49	60	63	81	88	88	88	92	98									
46	41	52	55	78	85	87	89	92	96	98								
48	37	48	53	72	79	86	89	90	91	91	96							
50	40	51	56	64	67	79	84	83	79	79	84	95						
52	41	50	54	66	71	81	87	85	82	81	84	94	98					
54	45	54	57	74	79	86	89	88	86	88	90	97	95	97				
56	43	50	54	76	84	86	87	89	93	94	96	97	86	89	96			
58	50	55	61	78	87	83	84	69	94	96	98	90	72	74	86	95		
60	55	62	66	80	88	83	83	88	95	99	98	90	71	71	85	95	100	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Table B10. Poker Flats—Correlation of July Density (kg m^{-3}) From 26 km to 60 km (Cont)

KM KILOMETERS ABOVE SEA LEVEL

MEAN AVERAGE OF OBSERVED VALUES

STDV STANDARD DEVIATION OF VALUES IN PERCENT OF MEAN TIMES 10

N NUMBER OF VALUES AT EACH ALTITUDE

KM	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60
*MEAN	327 -4	240 -4	176 -4	130 -4	954 -5	699 -5	515 -5	380 -5	281 -5	208 -5	155 -5	117 -5	868 -6	678 -6	521 -6	412 -6	308 -6	231 -6
STDV	112	112	115	122	124	127	125	123	131	132	141	145	144	144	149	78	77	84
N	23	23	23	23	23	23	23	23	23	23	22	20	20	19	18	17	12	5
28	100	**																
30	99	100																
32	99	99	100															
34	97	98	98	99														
36	96	97	98	99	100													
38	95	96	96	98	99	100												
40	94	95	96	98	99	99	100											
42	91	93	93	95	97	98	99	99										
44	91	93	93	95	97	98	99	99	99									
46	90	92	93	95	97	98	98	98	99	99								
48	91	93	94	95	97	98	98	98	99	99	100							
50	89	91	92	93	95	97	97	98	98	98	98	99						
52	89	91	91	93	95	96	97	97	98	97	97	98	99					
54	93	94	94	94	95	96	96	96	97	97	96	98	98	100				
56	69	73	73	72	[illegible]	82	83	83	85	86	85	85	92	96	96			
58	77	81	79	80	82	85	85	84	87	86	87	89	93	95	94	96		
60	98	98	98	96	91	91	92	91	86	91	85	86	87	82	86	89	96	

* MULTIPLY MEAN BY INDICATED NEGATIVE POWER OF 10

** MULTIPLY TABULAR VALUES BY 0.01 TO OBTAIN CORRELATION COEFFICIENTS

Appendix C

Sample Calculation for Estimating the Effect of Density on a Reentry Vehicle

The computations provided in this appendix illustrate how to estimate the effect that the mean monthly density and its day-to-day variations around the mean have on the trajectory of a reentry vehicle passing through the region between 11 and 5 km at Wallops Island in January.

For the purposes of this simplified example, the following influence coefficients for the vehicle have been assumed, such that a density of 1 kg m^{-3} at a specific altitude will have the indicated retarding effect through a 2-km layer of the atmosphere:

Layer (km)	Influence $(m(kg\ m^{-3})^{-1})$
11 - 9	800
9 - 7	400
7 - 5	200

The average distance short of a vacuum trajectory is the sum of the effects due to the mean monthly density at each level, as determined from Eq. (1) in the introduction to the main text:

Level (km)	Wallops Density (kg/m^3)		Influence ($m\ (kg\ m^{-3})^{-1}$)		Distance (m)
10	0.411	×	800	=	329
8	0.524	×	400	=	210
6	0.658	×	200	=	132
	Average distance short of trajectory			=	671 m

The integrated standard deviation of the deceleration due to day-to-day variations in the density profile is determined from Eq. (2) using standard deviations of density at levels 10, 8, and 6 km and coefficients of correlation between these levels as indicated in the array for Wallops Island, January, in Appendix B.

Coefficient of Correlation		Standard Deviation		Influence		Standard Deviation		Influence		Distance
		$(1.44 \times 10^{-2}$	×	$800)^2$					=	133
		$(7.86 \times 10^{-3}$	×	$400)^2$					=	10
		$(6.58 \times 10^{-3}$	×	$200)^2$					=	2
2× 0.86	×	1.44×10^{-2}	×	800	×	7.86×10^{-3}	×	400	=	62
2× -0.09	×	1.44×10^{-2}	×	800	×	6.58×10^{-3}	×	200	=	- 3
2× 0.25	×	7.86×10^{-3}	×	400	×	6.58×10^{-3}	×	200	=	2
								Total	=	$206\ m^2$

$\therefore\ \sigma^2 = 206\ m^2$, $\sigma = 14.4$ m, and $2\sigma = 29$ m.

Based on an assumption of a normal distribution of atmospheric density, the range of the missile will vary by less than 30 m from the mean monthly impact point 95 percent of the time. If the aim point takes into consideration the mean monthly density profile, the variations in the impact point due to day-to-day variations in the density profile will be within ± 30 m of the target 95 percent of the time.

Appendix D

Sample Calculation for Estimating an Extreme Vertical Density Gradient

The following is an illustration of how to estimate an extreme vertical density gradient that may be encountered by an aerospace vehicle.

The answer to the question "What is the vertical density gradient that will be equalled or exceeded 2.5 percent of the time between 40 and 42 km near Churchill in January?", may be obtained by using the following expression taken from Eq. (8):

$$\hat{\sigma} = \sqrt{\sigma_1^2 + \sigma_2^2 - 2\,R\,\sigma_1\,\sigma_2}\,, \tag{D1}$$

where σ_1^2 is the mean monthly density variance at level 1 (40 km), σ_2^2 is the variance at level 2 (42 km), R is the coefficient of correlation of density between values at 40 and 42 km, and σ is the standard deviation around the mean monthly gradient between these levels. From Appendix B for Churchill in January,

σ_{40} = 13.8 percent of 3.47×10^{-3} or 4.79×10^{-3} kg m^{-3}

σ_{42} = 14.4 percent of 2.56×10^{-3} or 3.69×10^{-3} kg m^{-3}

Mean monthly diff = 0.91×10^{-3} or 9.10×10^{-4} kg m^{-3}

R = 0.98 .

From Eq. (D1),

$\hat{\sigma} = 1.39 \times 10^{-4}$ kg m^{-3} or $2\hat{\sigma} = 2.78 \times 10^{-4}$ kg m^{-3}

Mean diff $= 9.10 \times 10^{-4}$ kg m^{-3}

Value exceeded 2.5 percent of time $= 11.88 \times 10^{-4}$ kg m^{-3}.

Consequently, an ascending vehicle will encounter $\dfrac{11.88 \times 10^{-4}}{4.75 \times 10^{-3}}$, [illegible] percent decrease in density, while a descending vehicle will encounter $\dfrac{11.88 \times 10^{-4}}{2.56 \times 10^{-3}}$, a 46 percent increase in density between 40 and 42 km near Churchill in January.

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